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97th Congress }
2d Session }

JOINT COMMITTEE PRINT

USSR: MEASURES OF ECONOMIC GROWTH AND DEVELOPMENT, 1950-80

STUDIES

PREPARED FOR THE USE OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

DECEMBER 8, 1982

COMPLETED

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I

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LETTERS OF TRANSMITTAL

OCTOBER 28, 1982.

To the Members of the Joint Economic Committee:

I am transmitting for the use of the Members of the Joint Economic Committee, other Members of Congress, and the public a volume of studies entitled "USSR: Measures of Economic Growth and Development, 1950-80." The volume was prepared by the Central Intelligence Agency at the request of the Joint Economic Committee.

The volume contains a series of tables estimating the Soviet gross national product and its components. Separate sections cover industrial production, agriculture, and consumption. Part I contains estimates of Soviet GNP by sector of origin and end use. Part II is an index of Soviet industrial production. Part III is an index of agricultural production. Part IV is an index of consumption. The studies also describe the methodology and data used.

The Joint Economic Committee is pleased to publish this study in the hopes that it will help improve our understanding of the Soviet economy. These studies fill a long-term gap in the West created by Soviet secrecy and deficiencies in the publication of official economic data as well as differences in the economic accounting system used in that country. The project was supervised for the Joint Economic Committee by Richard F. Kaufman.

Sincerely,

HENRY S. REUSS,
Chairman, Joint Economic Committee.

OCTOBER 26, 1982.

Hon. HENRY S. REUSS,
Chairman, Joint Economic Committee,
Congress of the United States,
Washington, D.C.

DEAR MR. CHAIRMAN: The attached is a volume of studies entitled "USSR: Measures of Economic Growth and Development, 1950-80." The studies were prepared by specialists at the Central Intelligence Agency at the request of the Committee. Taken together, they represent an up-to-date, comprehensive, quantified assessment of the Soviet economy.

Sincerely,

RICHARD F. KAUFMAN,
Assistant Director, Joint Economic Committee.

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FOREWORD

By Chairman Henry S. Reuss

The Soviet Union does not publish measures of economic growth and development comparable with those of Western countries. Rather, it publishes measures of growth that are geared to its own definitions of economic phenomena and its own political requirements. In addition, it follows a policy of secrecy with regard to much of its economic activities and has been inconsistent in the comparability and coverage of the economic statistics that are published. The result is a large gap in the information available in the West concerning the performance of the Soviet economy. To help fill this gap, the Central Intelligence Agency (CIA) has been called upon to provide quantified estimates of the value of Soviet gross national product (GNP), its rate of growth, its size relative to U.S. GNP, and its allocation among the various end uses—consumption, investment, and government expenditures, including defense.

The studies contained in this volume are the culmination of a large research effort over many years carried out by CIA's Directorate for Intelligence. The estimates of GNP and its components, which are included, are virtually the only independent Western estimates of these important measures of economic performance in the Soviet Union. Earlier results of this work have appeared in various Joint Economic Committee studies of the Soviet economy and CIA's annual *Handbook of Economic Statistics*. This publication is the first time that the concepts, methodologies, and data have been fully explained and documented in a comprehensive and up-to-date form.

The studies include separate sections devoted to agriculture and industry—the major components of the originating sectors in the GNP, and to consumption—the principal end-use sector. Part I discusses the overall estimates of Soviet GNP by sector of origin and end use. Each of the remaining three studies analyzes in detail a major component of GNP. Part II contains an index of industrial production. Part III is an index of agricultural production. And the final part is an index of consumption. Indices for all other sectors are included in Part I.

Each study includes detailed compilations of the data used, their sources, and the methodologies used to combine the data into the aggregate measures. The goals of this publication are to achieve a wider understanding of how the synthetic measures of Soviet economic performance are derived, to encourage their broader use in analyses of Soviet economic performance, and to stimulate discussion of ways to improve these measures and our general understanding of the Soviet economy.

NECESSITY TO CALCULATE INDEPENDENT MEASURES

There are several reasons for the calculation of independent measures of Soviet economic performance. The deficiencies of official Soviet measures of economic activity are well documented. Official Soviet measures are often conceptually different from the measures used in the West, are not published in sufficient detail, are sometimes published in noncomparable series, and tend to inflate real growth rates.

The official Soviet measure of economic growth, referred to as net material product, includes only the value added in the production of goods, and a few services. The value added in the rest of the service sector and all depreciation income is excluded. Thus, Soviet net material product omits about one-fourth of the resources used to produce goods and services in the USSR. In addition, there is an upward bias in official measures of activity. The result is that Soviet statistics on net material product provide an incomplete and distorted view of the size and growth of the Soviet economy.

The need for independent measures of economic performance is heightened by the sparseness of official data and their inconsistencies. The official data tend to be published in insufficient detail, the price base of some series are periodically changed, and the product coverage may be altered without notice.

For example, because the official measure of consumption referred to as "real incomes of the population," is not described adequately, its validity or usefulness cannot be fully assessed. The official series shows a higher growth rate than does the synthetically constructed index of consumption, in part because of the failure of the official series to take inflation into account.

The Soviet indices of industrial and agricultural production are based on gross output rather than value added. As a consequence, double counting of materials used in production is incorporated in the indices. There is considerable evidence that the official index for industrial production has serious short-comings due to the treatment of price and quality changes. There is much evidence that prices assigned to new industrial products are too high relative to prices for older products in view of the changes in technology and quality taking place.

In the consumer sector, there is considerable evidence that new, high-priced but only slightly altered products are deliberately substituted for equivalent, low-priced products to syphon-off consumer purchasing power. The official data treat such changes as if there were no real price increases, thus incorporating hidden inflation.

The General Approach

The value of GNP can be calculated in two ways. One way is to derive GNP as the sum of the various end uses of the goods and services—consumption, investment, and government (both military and civilian). GNP can also be computed as the sum of value added in the several production sectors—industry, agriculture, and the like.

The intent of these studies is to replicate as far as possible, on both the sector of origin and end use sides of the accounts, the methodologies developed by the U.S. Department of Commerce and the OECD for the construction of Western economic accounts. Precise conformity is not possible, primarily because the organization of the Soviet economy and the limited amount of data published by the Soviet Union require modifications and simplifications of the Western accounting framework. Defense expenditures are the most conspicuous example. Total defense is not identified separately in the Soviet GNP accounts contained in this volume because other GNP components, primarily investment and research and development expenditures, are thought to include substantial amounts of defense expenditures. As a separate exercise, the CIA estimates total defense expenditures directly from a detailed description of their defense programs and activities. The defense estimates have been explained and discussed in the Joint Economic Committee's annual hearings on the "Allocation of Resources in the Soviet Union and China."

Despite the limitations, it is believed that the measures developed—both the configuration of trends and absolute size—are reasonably accurate representations of Soviet economic performance, can be compared with confidence with similar measures for Western economies, and are far more acceptable indicators of economic performance than the corresponding measures published by the USSR.

Gross national product is defined as the market value of the final goods and services produced by a given country. As applied to the Soviet economy, this definition raises theoretical problems. The most important is that the Soviet Union does not have market determined prices. Instead, it uses, for the most part, centrally fixed prices which may be quite far removed from the values that would obtain in a market-oriented economy. Market prices reflecting real resource costs of each product are needed to derive theoretically correct inferences about the real growth and distribution of GNP. An important segment of Part I is devoted to computing a set of alternative, factor-cost prices used to replace Soviet prices. The latter are seriously distorted by taxes and subsidies and by their failure to incorporate accurately the costs of land and reproducible fixed assets. The factor-cost prices are intended to represent more accurately the actual cost of resources used to produce each category of goods and services.

The indices of the growth of GNP and its three major components are computed as weighted averages of subcomponent indices. The weights are 1970 expenditures or value added as derived in the 1970 GNP accounts (Part I, Appendix D). The subcomponent indices are developed from physical production or consumption data. The index of industrial production is computed from production data on over 300 products. These are grouped first into 10 branches of industry and then into an aggregate index. The index of agricultural production, computed by combining production data for 42 types of crops or livestock products, represents the value of all output less that used by agriculture itself—primarily feed and seed. The index of consumption is divided into three major categories of goods and eight categories of services. Each category is further divided into individual products or services. The index of GNP by sector of origin is formed by combining the indices of industrial and agricultural production with similar indices for the remaining production sectors—transportation, communications, domestic trade, and services. Similarly, GNP by end use is computed by adding indices of investment and other government expenditures, including most of defense outlays.

Major Problems Encountered

The construction of the independent measures encountered numerous problems. Some are universal to all aggregate measures of economic performance and some are peculiar to the Soviet case. The treatment of quality change, for example, is a universal problem. Most elements of the industrial index are expressed in physical units such as tons or number of items. This procedure may understate quality improvements over time, especially in machinery products. On the other hand, official data, expressed in rubles or as index numbers, are used where physical production data are not available. As indicated above, these data clearly overstate growth. Because the biases in official and physical data are offsetting, however, their use in combination should provide a truer measure of real growth. Similarly, the index of housing services in the consumption index is based on the number of square meters of housing without a quality adjustment. In this case, all evidence points to remarkably little improvement in the quality of Soviet housing and there is likely not a serious bias in the housing index.

Compiling consistent data for the period 1950-80 presented a challenge. Many of the official data series are incomplete or published in differing formats, requiring many interpolations and strong assumptions about relative prices. Other data are not published at all or not on a regular basis. Instead, they have to be culled from the specialized monograph and journal literature. For example, data on the amount of waste included in the gross output data of agricultural products are not published regularly or in a consistent framework.

Uses of the Studies

Just as aggregate measures of Western economic performance are used in many different applications, so the results of these studies can be employed in many ways. Foremost is their use in making assessments of the Soviet economy by analyzing the interplay of the disposition of resources for consumption, defense, and future growth. Insights into the regime's policies and priorities can be obtained by assessing the "burden" of defense and the pattern of allocating the "growth dividend." In addition to being a measure of the size and growth of the economy, GNP also provides a standard against which other economic variables can be measured, such as the amount of energy used per unit of GNP.

The GNP data base forms the foundation for forecasting, either by using large econometric models or other means. Such forecasts not only concern the future growth rate of total GNP, but also can be employed to assess other important variables, such as the domestic demand for oil.

The GNP estimates can be used to compare the size of the Soviet economy with the United States or other countries, and the relative priorities each country assigns to the uses of its national product. Such international comparisons depend, of course, on the domestic value of GNP or one of its components. For example, an earlier publication in this series estimated the value of Soviet consumption relative to other countries.[1]

Despite the limitations of the estimates, the work expended on the CIA independent measures represents a valuable contribution to economic analysis of the USSR. The results shown in this volume present a picture of Soviet economic growth different from that given by the official measures. Each of the four studies presents comparative results in detail. By way of summary, the following tabulation compares average annual growth rates for the four aggregate indices and their closest Soviet official counterparts for 1951–80:

Average annual rate of growth in the years 1951–80

[Percent]

	CIA measure	Soviet measure
GNP[1]	4.7	7.4
Industrial production	6.8	8.7
Agriculture production[2]	2.8	3.1
Per capita consumption	3.5	5.0

[1] The CIA measure for the same coverage as the Soviet measure (see text) is 5.3 percent per year

[2] The measure shown represents "net output," or gross output less products used by agriculture (seed and feed). This is the concept of output closest in coverage to the official Soviet measure of farm output. As a contributing sector to GNP the appropriate measure for agriculture output is value added (net output less material purchases from other sectors) which over this period grew at 2.0 percent per year.

It is clear that, except for agriculture, the growth rate differences are large and, over a 30-year period, indicate a significantly different picture of economic growth than that provided by official Soviet statistics.

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[1] "Consumption in the USSR: An International Comparison," U.S. Congress, Joint Economic Committee, August 1981.

THE CONTRIBUTIONS OF RUSH V. GREENSLADE

The research in this volume owes an immense debt to the work of the late Rush V. Greenslade. Dr. Greenslade was employed at the Central Intelligence Agency from the early 1950's until his retirement in 1973. For many years he directed CIA's research on the Soviet economy. After his retirement, he continued as a consultant and advisor to the CIA until his death in 1978.

Dr. Greenslade's primary contributions were in the area of quantifying and analyzing Soviet economic development. He developed an index of Soviet industrial production in the 1950's and wrote frequently on industrial trends. He was also closely involved in shaping the analytical framework and in organizing the collection of data for estimates of Soviet GNP. In the early 1970's, he led an effort to convert the GNP estimate to 1970 prices and to reexamine and improve all of the methodologies and data supporting these estimates. This work led to the publication by the CIA of a set of GNP accounts for 1970 and an article in the Joint Economic Committee's 1976 compendium on the Soviet economy, "The Real Gross National Product of the U.S.S.R., 1950–1975."

This volume extends Dr. Greenslade's work by updating and documenting the 1970 base-year accounts and the many time series used in calculating each sector-of-origin and end-use GNP index.

Dr. Greenslade was also deeply involved in the analysis of the size and structure of the Soviet economy in relation to that of the United States and other countries. An earlier volume in this series on Soviet GNP compared Soviet consumption with consumption in the United States and other countries. This project was designed and directed in its early stages by Dr. Greenslade. Dr. Greenslade also played a leading role in forming estimates of the dollar value of Soviet investment based on new ruble-dollar ratios for machinery and construction. The results of this ruble-dollar ratio research were published by the CIA. Dr. Greenslade's research on international economic comparisons culminated in a new comparison of Soviet and United States GNP since 1955 published by Edwards, Hughes, and Noren in the Joint Economic Committee's 1979 compendium on the Soviet economy.

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USSR: MEASURES OF ECONOMIC GROWTH AND DEVELOPMENT, 1950–80

Central Intelligence Agency
Directorate of Intelligence

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Part I. GROSS NATIONAL PRODUCT OF THE USSR, 1950-80

By John Pitzer

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Irving B. Kravis, Alan Heston, and Robert Summers, *International Comparisons of Real Product and Purchasing Power*, United Nations International Comparisons Project, Phase II (Baltimore, The Johns Hopkins University Press, 1978)	ICP, Phase II
Abraham S. Becker, *Soviet National Income, 1958-1964* (Berkeley, University of California Press, 1969)	Becker, 1969
Abram Bergson, *The Real National Income of Soviet Russia Since 1928* (Cambridge, Mass., Harvard University Press, 1961)	Bergson, 1961
Abram Bergson, *Productivity and the Social System: The USSR and the West* (Cambridge, Mass., Harvard University Press, 1978)	Bergson, 1978
Vladimir G. Treml and John P. Hardt, eds., *Soviet Economic Statistics* (Durham, N.C., Duke University Press, 1972)	Treml and Hardt

Gross National Product of the USSR, 1950-80

Introduction

This paper presents estimates of the real growth of Soviet gross national product (GNP) since 1950 developed by the Central Intelligence Agency and describes the methodology used to construct those estimates. An earlier publication presented our estimates of Soviet GNP for a single base year, 1970, in both established and factor-cost prices.[1] This paper revises the 1970 GNP estimates based on information collected since their publication and develops constant-price activity indexes to move each component of 1970 GNP over time.[2] The result is an estimate of the growth of Soviet GNP in 1970 prices since 1950.

Our Estimates in Perspective

The Soviet GNP data presented here supplement an already large body of research. The accounting structure closely follows the one pioneered by Professor Abram Bergson and further developed by scholars at the Rand Corporation.[3] The result of their efforts is a set of Soviet GNP accounts for 1928, 1937, 1940, 1944, and 1948-66 in current rubles. Bergson also devised the adjusted factor-cost standard (AFCS) in order to correct some of the distortions caused by the Soviet pricing system. He recalculated GNP using factor-cost prices, which are determined by imputing a uniform capital charge in place of profits, and eliminating the highly discriminatory turnover tax.

In order to compute the real growth of Soviet GNP, Bergson developed price indexes to deflate the current-price values of each end-use component of GNP. Becker similarly computed the real growth of Soviet GNP from 1958 to 1964 in both 1958 and 1964 factor-cost prices.[4]

A number of other scholars have published estimates of Soviet GNP. Two estimates for early years are by Baran and Seton.[5] The United Nations, Bornstein, and Cohn constructed GNP accounts for single years in the 1950s.[6] More closely related to this study are calculations of the real growth of Soviet GNP for extended time periods by Moorsteen and Powell, Kaplan, and Cohn.[7] The latter three studies combine a distribution of Soviet GNP by sector of origin for a base year with constant-price activity indexes for each sector to estimate the real growth of Soviet GNP in the prices of the base year. The most recent study is by Lee who constructed end-use accounts for 1955-75.[8]

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[1] CIA, *GNP 1970*.

[2] Preliminary versions of the time-series data presented here were published in Herbert Block, "Soviet Economic Performance in a Global Context," JEC, *1979*, vol. 1, pp. 135-140; and Rush V. Greenslade, "The Real Gross National Product of the U.S.S.R., 1950-1975," JEC, *1976*, pp. 269-300.

[3] The principal publications, in order of the years for which the GNP accounts were constructed are: Oleg Hoeffding, *Soviet National Income and Product in 1928*, Columbia University Press, New York, 1954; Abram Bergson, *Soviet National Income and Product in 1937*, Columbia University Press, New York, 1953; Abram Bergson and Hans Heymann, Jr., *Soviet National Income and Product, 1940-48*, Columbia University Press, New York, 1954; Abram Bergson, Hans Heymann, Jr., and Oleg Hoeffding, *Soviet National Income and Product, 1928-1948: Revised Data*, Research Memorandum 2544, The Rand Corporation, Santa Monica, Calif., 1960; Bergson, 1961; Oleg Hoeffding and Nancy Nimitz, *Soviet National Income and Product, 1949-1955*, Research Memorandum 2101, The Rand Corporation, Santa Monica, Calif., 1959; Nancy Nimitz, *Soviet National Income and Product, 1956-1958*, Research Memorandum 3112-PR, The Rand Corporation, Santa Monica, Calif., 1962; Becker, 1969; and Sally Anderson, *Soviet National Income, 1964-1966, in Established Prices*, Research Memorandum 5705-PR, The Rand Corporation, Santa Monica, Calif., 1968.

[4] Bergson, 1961, pt. 3; and Becker, 1969, ch. 6.

[5] Paul A. Baran, "National Income and Product of the USSR in 1940," *Review of Economic Statistics* 29, November 1947, pp. 226-234; and Francis Seton, "The Social Accounts of the Soviet Union in 1934," *Review of Economics and Statistics* 36, August 1954, pp. 290-308.

[6] "An Estimate of the National Accounts of the Soviet Union for 1955," *Economic Bulletin for Europe* 9, United Nations, Economic Commission for Europe, May 1957, pp. 89-107; Morris Bornstein et al., "Soviet National Accounts for 1955," Center for Russian Studies, The University of Michigan, 1961 (mimeographed); and Stanly Cohn, *Derivation of 1959 Value-Added Weights for Originating Sectors of Soviet Gross National Product*, Technical Paper RAC-TP-210, The Research Analysis Corporation, McLean, Va., 1966.

[7] Richard Moorsteen and Raymond P. Powell, *The Soviet Capital Stock, 1928-1962*, app. P, Richard D. Irwin, Homewood, Ill., 1966; Norman Kaplan, *The Record of Soviet Economic Growth*, Research Memorandum 6169, The Rand Corporation, Santa Monica, Calif., 1969; and Stanly Cohn, "General Growth Performance of the Soviet Economy," *Economic Performance and the Military Burden in the Soviet Union*, US Congress, Joint Economic Committee, Government Printing Office, Washington, D.C., 1970, pp. 9-17.

This paper combines the sector-of-origin and end-use approaches to estimating the real growth of Soviet GNP. First, the GNP accounts are constructed for 1970 in established prices following the Bergson model. Second, the income side of the GNP account is rearranged by sector of origin. Third, GNP by sector of origin is converted to factor-cost prices, and the factor-cost correction is carried over to GNP by end use via an estimated 1970 input-output table. Fourth, indexes in 1970 prices are constructed for each sector-of-origin and end-use component. Finally, the component indexes are combined using the 1970 weights in factor-cost prices to estimate the real growth of Soviet GNP both by sector of origin and end use. The results are intended to measure changes in both production potential and actual resource allocation over time.

Soviet National Income Data

The Central Statistical Administration of the Soviet Union compiles its own measure of aggregate economic activity, usually labeled net material product (NMP) in the West.[9] The annual Soviet statistical handbook, *Narkhoz 19—*, provides data on total Soviet NMP, including five sector-of-origin and two end-use components. There are three principal reasons for compiling an independent index of Soviet economic activity rather than accepting the Soviet measure: (1) there are important differences in coverage between NMP and GNP, (2) we do not have sufficient knowledge of the methodological base of the NMP data, and (3) the Soviet data in purported constant prices are subject to major price distortions.

The main difference between NMP and GNP is that NMP does not include the value added in the production of most services, or a capital consumption allowance.[10] To build an estimate of GNP from Soviet data, these two quantities, which represented about 25 percent of GNP in 1970, must be estimated in the desired detail. Historically, production of the excluded services has grown more slowly than the other components of GNP and, therefore, this difference in coverage has imparted an upward bias to the growth of NMP.

The omission of depreciation from NMP affects the growth rate if total depreciation grows more rapidly than the other elements of value added, or if the base-year distribution of depreciation among the sectors of origin differs markedly from the distribution of the remaining components of value added. The available data are not sufficient to infer the direction of the bias in the growth rate of NMP due to the omission of depreciation. The exclusion of depreciation does, of course, affect the absolute size of NMP.

The Soviet Government regularly publishes annual data on total NMP produced in both current and constant prices, but the five sector-of-origin components are given only in current prices. Annual data are also published in current prices for "NMP used," disaggregated into two end uses—"consumption" and "accumulation and other outlays"; similar data in constant prices have been published only for recent five-year periods. Even if suitable deflators could be devised, the published sectoral disaggregations are far too few to support systematic analysis of structural changes in the economy or to provide adequate data for economic modeling.

The problems in using the NMP data are complicated by gaps in our knowledge about the methodology used to compile the data. The Soviets have never published a manual setting out their procedures in detail. The nearest thing to such a manual was prepared by the CEMA secretariat for publication by the United Nations.[11] This document sets out only the general procedures and states that individual nations of CEMA frequently diverge from them. Various Soviet authors, including some known to hold important positions in the Central Statistical Administration, have published books on NMP. It is never clear, however, whether these books represent official statements or personal opinions. The lack of knowledge of Soviet NMP practices makes it difficult to know how to adjust NMP in order to reach GNP. The dividing line between NMP and GNP is not always clear, and the user of the NMP data is left to guess the correct interpretation.[12]

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[8] W. T. Lee, "USSR Gross National Product in Established Prices, 1955-1975," *Jahrbuch der Wirtschaft Osteuropas*, vol. 8, 1979, pp. 399-429.

[9] The actual Soviet term *(natsional'niy dokhod)* translates as "national income." Since the same term is used in Western GNP accounting for a different concept, the Soviet term is referred to as net material product; it measures the net value added in the production of material goods.

[10] See *USSR: Toward a Reconciliation of Marxist and Western Measures of National Income*, US Central Intelligence Agency, Washington, D.C., 1978, for a more detailed discussion of the differences between the GNP and NMP concepts.

The third principal reason for making independent GNP estimates is that Soviet data on the real growth of NMP and sectoral output involve considerable overstatement. Soviet NMP increased 57 percent in constant prices and 51 percent in current prices from 1970 to 1979, which implies *deflation* in the Soviet Union since 1970.[13] In contrast, most studies by Western scholars indicate that there is persistent *inflation* in the Soviet Union, both overt and repressed. For example, Cohn allocated the difference in the growth rates of Western estimates of Soviet GNP and Soviet NMP to differences in (1) coverage, (2) the weights assigned to each sector, and (3) sectoral growth rates. He found the latter to be the most important.[14]

The chief cause of the difference in sectoral growth rates in the postwar period is believed to be the Soviet method of accounting for the production of new industrial products. In constructing an output series in constant prices, a price must be imputed to products introduced after the base year. In theory, the Soviets assign each new product a price high enough to recover research, development, and introductory production costs. After these initial costs are recovered, the price of the new product is supposed to be lowered and a permanent price established. In practice, however, pricing procedures are used by Soviet managers to inflate the growth of output in two ways. Often old products are altered slightly and declared to be new products with unjustifiably higher prices, and genuinely new products are allowed to retain their introductory price as a permanent price. In both cases, the unjustifiably high price is used by the Soviets as the base-year price needed for the constant-price output calculation. The impact of the new-product pricing problem will be greatest in those sectors with a high rate of innovation, primarily the machinery and chemicals branches of industry in the Soviet Union.[15]

The Plan of the Paper

This paper is divided into two main parts. Part I presents and analyzes the results; detailed description of the construction of individual sector indexes is reserved for the appendixes. The first sections examine the estimated growth rates for both total GNP and its principal components, the percentage distribution of GNP over time, major shifts in resource allocation, the growth of per capita consumption, and international comparisons of the growth and structure of the Soviet economy. The final sections of part I assess the accuracy and reliability of the results.

Part II sets out the methodology used to construct base-year weights in factor-cost prices and the indexes of real economic activity. The methodology itself is presented in four sections: the accounting framework, the valuation problem, conversion of the 1970 GNP accounts from established prices to factor-cost prices, and the construction of constant-price activity indexes. The final section briefly describes the nature of the various end-use and sector-of-origin indexes.

[11] *Basic Principles of the System of Balances of the National Economy*, United Nations, New York, 1971.

[12] See Abraham S. Becker, "National Income Accounting in the USSR," in Treml and Hardt, pp. 115-119, for a discussion of this problem.

[13] *Narkhoz 1979*, p. 405.

[14] Stanly H. Cohn, "National Income Growth Statistics," in Treml and Hardt, pp. 136-137. For a recent look at inflation in general see Alec Nove, *Political Economy and Soviet Socialism*, ch. 11, George Allen & Unwin, London, 1979.

[15] See *Comparing Planned and Actual Growth of Industrial Output in Centrally Planned Economies*, Central Intelligence Agency, Washington, D.C., 1980, p. 6; and Rush V. Greenslade, "Industrial Production Statistics in the USSR," in Treml and Hardt, pp. 181-186, for discussions of the new-product price issue.

Appendix A contains the detailed statistical results of this study. Appendixes B and C document the methodologies used to construct those individual sector-of-origin and end-use indexes not described elsewhere. Appendix D describes the revisions in the 1970 established-price accounts, and appendix E describes the methodology used to convert the 1970 established-price values to a factor-cost basis.

Part I
Results and Analysis [16]

Soviet Economic Growth in Perspective

National economic accounts constructed for the Soviet Union along conventional Western lines confirm that the Soviet economy has experienced rapid growth since 1950. The output of the Soviet Union in 1980 was about four times the level in 1950 (figure 1), the result of an average annual growth rate of 4.7 percent.

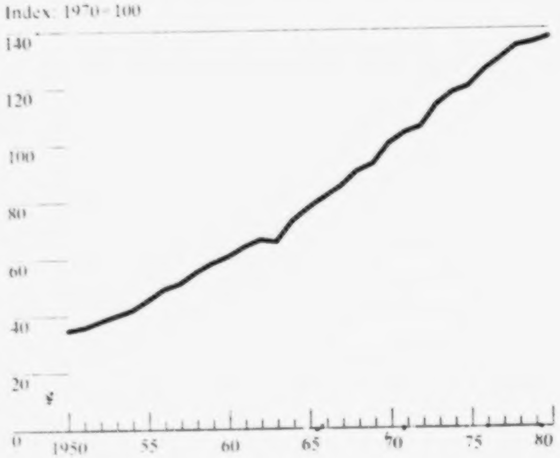
Changes in Soviet Growth Since 1950

The pace of advance over this 30-year period, however, has not been steady. In fact, annual rates of growth have been characterized by both wide year-to-year swings and a pronounced downward trend (figure 2). Despite this volatility, an absolute fall in GNP from one year to the next—that is, a negative growth rate—has been extremely rare.[17] The downward trend shows up clearly in average annual rates of GNP growth for each of the five-year plan periods between 1950 and 1980:

Five-Year Period	Average Annual Percentage Growth
1951-55	5.5
1956-60	5.9
1961-65	5.0
1966-70	5.2
1971-75	3.7
1976-80	2.7

Figure 1

Growth of Soviet GNP



These data suggest that the Soviet economy has been in a strong growth slide since the late 1960s, and that the average growth rate in the late 1970s was barely half the rate of 10 years earlier.[18]

The wide year-to-year fluctuations in Soviet growth are due primarily to swings in agricultural production. Agriculture still represents a large part of the Soviet

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[16] All of the results presented here are in terms of 1970 factor-cost prices unless otherwise stated. Part II discusses the rationale for using these synthetic prices.

[17] The single occurrence is 1963 when an enormous reduction in the inventory of livestock following a disastrous harvest drove the growth rate down to −1.1 percent. This decline is probably exaggerated because the livestock index uses an average value per head and most of the animals which were slaughtered in 1963 were relatively low-valued young livestock.

[18] Conventional average annual rate-of-growth calculations are subject to potential distortion if either of the end years is abnormal. Alternative calculations based on procedures developed by Boris Pesek, "Economic Growth and its Measurement," *Economic Development and Cultural Change* 9, April 1961, pp. 295-315 to reduce this source of distortion yield results which show only small differences in the rates of growth calculated above. The Pesek average annual growth rates for the five-year periods listed in the tabulation above are: 1951-55, 5.5; 1956-60, 5.8; 1961-65, 4.8; 1966-70, 5.1; 1971-75, 4.0; and 1976-80, 2.6 percent per year.

Figure 2

Annual Soviet GNP Growth Rates

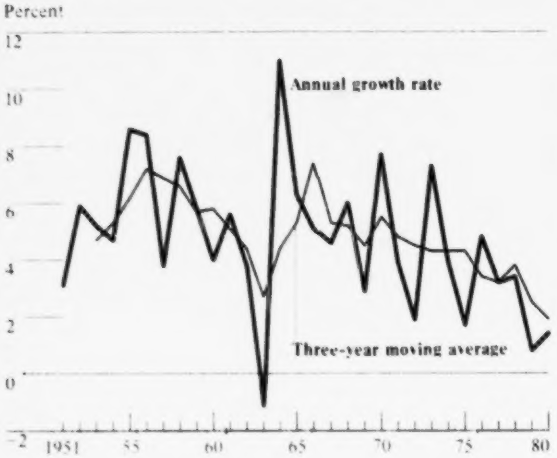
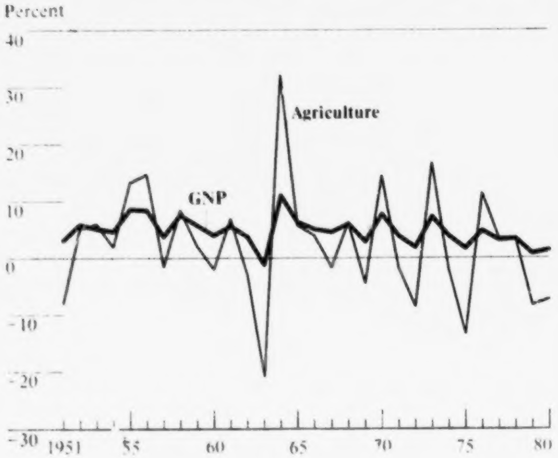


Figure 3

Growth Rates of Soviet GNP and Agriculture



economy—14 percent of GNP produced in 1980 (measured in 1970 prices). As a result of geoclimatic limitations and cropping practices, Soviet agricultural output is subject to large variations.[19] It is not at all unusual for agricultural output to fall from one year to the next, but such declines usually have been followed by a return to more normal weather and therefore a more normal level of output from agriculture in the following years. The recovery shows up as a very high growth rate of GNP in the year after a shortfall in agriculture, producing a distinct saw-tooth pattern to annual growth rates in GNP (figure 3).

While agriculture is the major source of sharp annual swings in GNP growth, industry, with its large weight in total GNP (37 percent in 1980 in 1970 prices), appears to be the major source of the secular decline in growth. Industrial growth, although generally exceeding that of GNP, has slowed from the 8- to 12-percent-per-year range in the 1950s to the 3- to 4-percent-per-year range in the late 1970s (figure 4).

The Evolving Structure of the Soviet Economy

The structure of the Soviet economy has changed dramatically since 1950 (figure 5).[20] By far the most important change has been the decline in the share of GNP produced in agriculture and the steady increase in the share produced in industry. Other notable trends are the growing importance of transportation and—surprisingly—the declining relative importance of the service sector.

[19] Year-to-year variation in Soviet agricultural output is three times greater than in the United States. See Douglas B. Diamond and W. Lee Davis, "Comparative Growth in Output and Productivity in U.S. and U.S.S.R. Agriculture," JEC, *1979*, vol. 2, p. 20.

[20] The percentage shares of GNP are calculated in 1970 factor-cost prices. A more accurate portrayal of changes in the structure of GNP would be obtained by computing the shares in current factor-cost prices. Unfortunately, those data are not currently available.

Figure 4

Growth Rates of Soviet GNP and Industry

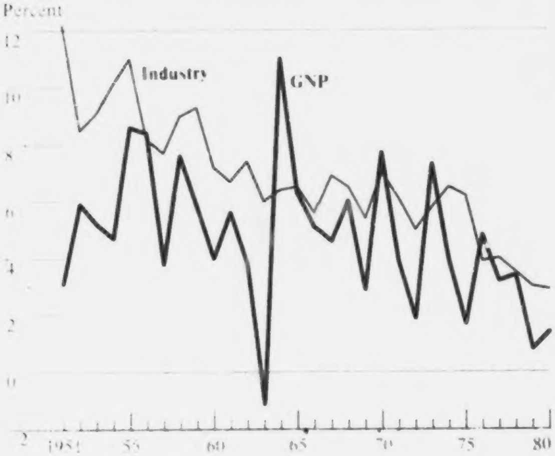
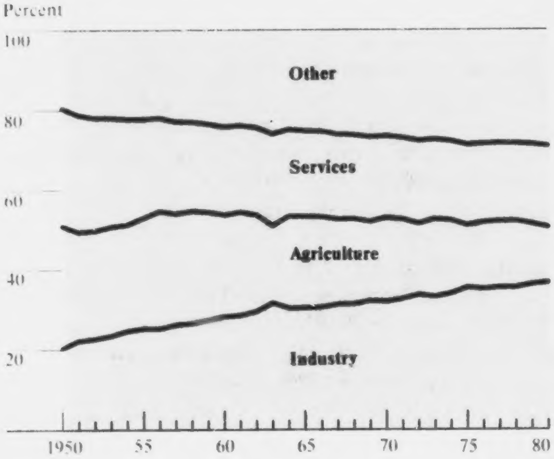


Figure 5

Distribution of Soviet GNP by Sector of Origin



As a result of the Soviet Union's long-term policy of emphasizing industrial development, the share of GNP created in industry has increased steadily from 20 percent in 1950 to 37 percent in 1980. The rate of growth of industry's share of GNP has been slowing, however, and has changed little in the late 1970s. Among the branches of industry, the machinery and chemicals branches have had the highest growth rates. The machinery share of GNP has risen from 6 percent in 1950 to 14 percent in 1980, while the chemicals share has risen from 1 to 3 percent of GNP.[21]

Agriculture's share of GNP has dropped from 31 percent in 1950 to 14 percent in 1980. As discussed above, fluctuation in the index of agricultural production is the dominant cause of fluctuation in the growth rate of GNP. Since the relative importance of agriculture in the Soviet economy probably will continue to decrease, the repercussions of its future fluctuations on GNP growth should diminish.

The demand for transportation, communications, and trade services is derived for the most part from the growth of industry and construction. Consequently, the share of these three sectors in GNP has grown significantly:

	Percentage Share of GNP			
	1950	1960	1970	1980
Transportation	3.9	6.8	8.7	10.3
Communications	0.6	0.7	0.9	1.2
Trade	5.0	6.8	7.3	7.7

In particular, the increase in the share of GNP produced in the transportation sector can be attributed to the increasing size of the industrial sector, which relies on transportation to move raw materials and products; the increasing specialization within industry, which leads to more transportation of semiprocessed materials; and the shifting of industrial production toward Siberia, which leads to longer shipping distances to reach the European population centers. Within the transport sector itself, the share of rail transport has been steadily falling: rail freight transport accounted for 86 percent of total freight revenue in 1950 in the sample used in this study to estimate the contribution of this sector to GNP and only 47 percent in 1980, as air and truck freight transport expanded rapidly from minuscule levels.

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[21] See JEC, *Industry*, for an analysis of the development of Soviet industry.

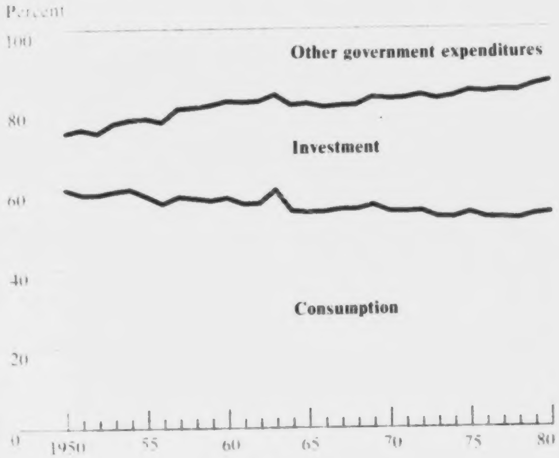
The share of GNP produced in the service sector has declined from 29 percent in 1950 to 20 percent in 1970.[22] This decline has been shared by almost all of the individual services; only science has shown any appreciable growth as a share of GNP, rising from 1.1 percent of GNP in 1950 to 2.3 percent in 1980. The decreasing share of GNP produced in the service sector is contrary to the experience of most developing nations. Normally an increase in the income level of a nation leads to above-average growth in the demand for services. The below-average growth of services in the USSR suggests a deliberate policy to restrain the development of services.

Changing Patterns of Output Use

Accompanying the shifts in the producing structure of the Soviet economy has been a changing pattern of output use since 1950. The dominant trend is the increasing share of GNP which is allocated to investment at the expense of most other use categories. Measured in 1970 prices, expenditures on investment have climbed from 14 percent of GNP in 1950 to 33 percent in 1980 (figure 6). The growth of investment reflects partially the traditional Soviet emphasis on growth through rapid increases in capital stock. Moreover, there has been a pronounced change in the structure of investment. The share of expenditures for the sum of producer durables and new construction allocated to producer durables alone has risen from 22 percent in 1950 to 39 percent in 1980.[23] This shift reflects the increasing emphasis toward reequipping and modernizing existing production sites rather than creating entirely new facilities. The growth rate for investment has slowed sharply, however, from 11.5 percent per year for the 1950s to an average of 5.8 percent per year since 1960. The direct consequence of slower investment growth is a smaller contribution to GNP growth through a larger capital stock.

Figure 6

Distribution of Soviet GNP by End Use



Defense is a major claimant on Soviet resources. Although no data are presented here on total defense expenditures, it is believed that total defense expenditures amounted to 11 to 13 percent of GNP in 1970 and have increased at an average annual rate of 4 to 5 percent per year since 1965.[24] Since this rate is somewhat above the growth in GNP during that period, the share of GNP allocated to defense has

[22] The service sector includes housing, utilities, repair and personal care, recreation, education, health, science, credit and insurance, and government administrative services.

[23] Table A-6. This change in the structure of Soviet investment is analyzed by Boris Rumor, *The Dynamics of the Capital Coefficient of USSR Industrial Output: Investment Process in Soviet Industry*, National Council for Soviet and East European Research, 1981.

[24] *Allocation of Resources in the Soviet Union—1980*, US Congress, Joint Economic Committee, Government Printing Office, Washington, D.C., 1981, p. 124.

increased slightly since 1965. Total defense expenditures are not presented as a separate end-use category because we believe that some defense expenditures are contained in several other components of GNP. Investment probably includes the procurement of common use durables, such as trucks and transport aircraft, and the construction of military facilities. Science probably is very heavily weighted toward defense expenditures. Other defense expenditures could well be contained in administration, education, and health expenditures. Because of many uncertainties, no estimate is made here of the values of defense expenditures included in the other end-use categories. Estimates of total defense expenditures have been made by the CIA independent of the GNP accounts. These data are presented for reference in appendix C.

Consumption has declined as a share of GNP from 60 percent in 1950 to 54 percent in 1980. Consumption consists of two principal components, goods and services, which have shown similar growth rates. The consumption of goods has grown at an annual rate of 4.3 percent per year since 1950, and services at 4.2 percent compared with 4.7 percent for GNP. As a result, the consumer goods share of GNP has declined from 38 percent in 1950 to 34 percent in 1980, while the consumer services share has declined from 22 to 20 percent. Within consumption, there have been sizable structural changes. The consumption of food has declined sharply as a share of GNP, from 32 percent in 1950 to 23 percent in 1980, while the consumption of soft goods and durables has risen as a share of GNP from 6 percent in 1950 to 11 percent in 1980.

Trends in per capita consumption are more useful indicators of the impact on living standards of resources allocated to consumption than are trends in total consumption. Measured at factor cost, Soviet per capita consumption has grown at an average annual rate of 2.9 percent since 1950, but only 2.2 percent since 1970—reflecting both the overall slowdown in GNP growth and the falling share of consumption in GNP.

Soviet Growth in International Perspective

Without doubt the Soviet economy has achieved rapid growth since 1950. This performance, however, can best be interpreted and understood when compared with growth trends in other countries during the same period. These trends can be measured in terms of GNP growth, priorities in output use, and growth in per capita consumption.

Comparisons of GNP Growth. Table 1 compares the average annual rates of growth of GNP for the Soviet Union and of gross domestic product (GDP) for selected OECD countries.[25] For the entire 1951-79 period, the figure for the Soviet Union is roughly in the middle of the OECD range. Japan, West Germany, Spain, and Turkey clearly achieved faster growth than the Soviet Union, and several other nations achieved rates close to the Soviet figure. In comparison with the United States, the Soviet Union consistently enjoyed a higher growth rate until the late 1970s. The average annual growth rate of Soviet GNP is a full percentage point higher than that of the United States for the entire 1951-79 period. Since 1970, however, the growth rate of Soviet GNP has declined steadily, while the US growth rate has continued at roughly an unchanged tempo. As a result, the US and Soviet economies grew by almost the same average rates in the 1970s.

Priorities in Output Use. Another way of comparing the performance of the Soviet and OECD economies is to examine the patterns of output use. Table 2 shows the percentage distribution of the GDP of several OECD countries and of the GNP of the Soviet Union among consumption, investment, and all other expenditures. The data for the Soviet Union are not strictly comparable with those for the OECD countries because Soviet Government expenditures for health, education, and physical culture are included in consumption. These expenditures were equal to 5.5 percent of Soviet GNP in 1970 and serve to inflate Soviet consumption data relative to the OECD data.[26]

The share of Soviet GNP allocated to investment, measured in 1970 prices, has steadily increased—from 14 percent in 1950 to 32 percent in 1979—while

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[25] The difference between GNP and GDP for the Soviet Union is negligible and can be ignored for these comparisons.

[26] JEC, *Consumption Comparison*, makes careful adjustments for these definitional differences and obtains similar changes in the consumption shares to those shown in table 2. The absolute levels of the adjusted consumption shares, as expected, are higher.

Table 1

Percent

Average Annual Rate of Growth of National Product for Selected OECD Countries (GDP) and for the USSR (GNP)

	1951-55 [a]	1956-60	1961-65	1966-70	1971-75	1976-79	1951-79 [a]
Total OECD	NA	NA	**5.2**	**4.8**	**3.1**	**4.0**	NA
Of which							
Canada	5.2	4.0	5.7	4.8	5.0	3.7	4.8
United States	4.2	2.3	4.6	3.1	2.3	4.4	3.4
Japan	7.2	8.6	10.0	12.2	5.0	5.9	8.3
Australia	3.8	4.0	4.8	6.0	3.5	2.4	4.2
New Zealand	3.8	4.0	4.9	2.7	4.0	0.3	3.3
Finland	5.0	4.1	4.8	4.8	3.9	2.5	4.2
France	3.7	5.0	5.8	5.4	4.0	3.7	4.6
West Germany	9.2	6.5	5.0	4.4	2.1	4.0	5.1
Italy	5.6	5.5	5.2	6.2	2.4	3.8	4.8
Netherlands	5.9	4.0	4.8	5.5	3.2	3.1	4.4
Norway	3.8	3.3	4.8	3.7	4.6	4.2	4.1
Spain	5.2	3.2	8.5	6.2	5.5	2.5	5.3
Sweden	3.4	3.4	5.2	3.9	2.7	1.1	3.4
Switzerland	4.9	4.3	5.2	4.2	0.8	0.9	3.5
Turkey	8.1	4.6	4.8	6.6	7.5	4.1	6.0
United Kingdom	3.9	2.6	3.1	2.5	2.0	2.4	2.7
USSR	**5.5**	**5.9**	**5.0**	**5.2**	**3.7**	**3.0**	**4.8**

[a] Data in column 1 for Japan and the United Kingdom are for 1953-55; for Finland, France, West Germany, Italy, and the Netherlands—1952-55; and for New Zealand and Spain—1955 only. The corresponding data in column 7 are for 1953-79, 1952-79, and 1955-79, respectively.

NA = not available.

Sources: OECD data are from *National Accounts of OECD Countries*, OECD, Paris, 1981, except for the value for total OECD for 1961-65. The latter value is from the 1980 edition of the same publication. USSR data are from table A-5.

Table 2

Percentage Distribution of National Product by End Use in Selected OECD Countries (GDP) and in the USSR (GNP)

	Consumption				Investment				All Other Expenditures			
	1950	1960	1970	1979	1950	1960	1970	1979	1950	1960	1970	1979
Total OECD	NA	**60.1**	**59.3**	**61.0**	NA	**20.2**	**22.8**	**21.2**	NA	**19.7**	**17.9**	**17.8**
Of which												
Canada	55.2	57.5	53.3	57.0	21.1	22.5	21.7	22.2	23.7	20.0	25.0	20.8
United States	62.1	60.9	62.2	64.6	19.5	18.2	18.4	17.4	18.4	20.9	19.4	18.0
Japan	63.2[a]	63.2	54.4	55.4	15.1[a]	23.1	34.9	33.2	21.7[a]	13.7	10.7	11.4
Australia	67.5	61.5	57.7	59.3	24.4	24.6	26.5	21.2	8.1	13.9	15.8	19.5
New Zealand	NA	68.2	59.9	62.4	NA	NA	NA	NA	NA	NA	NA	NA
Finland	52.8[b]	54.4	55.1	54.1	25.5[b]	30.1	28.6	23.2	21.7[b]	15.5	16.3	22.7
France	60.0[b]	60.3	59.1	62.6	17.3[b]	19.3	23.8	21.5	22.7[b]	20.4	17.1	15.9
West Germany	52.5[b]	52.0	53.3	54.7	20.1[b]	24.0	24.1	22.2	27.4[b]	24.0	22.6	23.1
Italy	66.1[b]	59.4	63.6	62.4	15.6[b]	26.0	24.4	18.9	18.3[b]	14.6	12.0	18.7
Netherlands	56.9[b]	51.8	57.4	59.8	18.6[b]	21.6	25.3	20.8	24.5[b]	26.6	17.3	19.4
Norway	61.1	57.9	54.1	48.6	27.3	26.3	28.2	26.3	11.6	15.8	17.7	25.1
Spain	72.9[c]	69.9	67.4	68.8	15.6[c]	16.7	23.1	20.0	11.5[c]	13.4	9.5	11.2
Sweden	62.3	56.8	52.3	52.5	16.7	20.6	21.6	19.0	21.0	22.6	26.1	28.5
Switzerland	67.4	58.7	58.4	63.9	16.2	23.7	25.5	23.6	16.4	17.6	16.1	12.5
Turkey	77.3	79.7	73.9	72.9	16.8	15.5	19.4	16.6	5.9	4.8	6.7	10.5
United Kingdom	62.6[a]	63.7	61.0	61.4	12.7[a]	16.7	20.7	17.9	24.7[a]	18.6	18.3	20.7
USSR	**59.9**	**57.7**	**54.2**	**53.2**	**14.2**	**24.2**	**28.2**	**32.5**	**25.8**	**18.1**	**17.6**	**14.3**

[a] The data are for 1952.
[b] The data are for 1951.
[c] The data are for 1954.

NA = not available.

Sources: OECD data are from *National Acounts of OECD Countries*, OECD, Paris, 1981, except for the value for total OECD for 1960. The latter value is from the 1980 edition of the same publication. The USSR data are from table A-11. All percentages, except for total OECD, are calculated using data expressed in domestic currencies in constant prices. The total OECD data are calculated using data expressed in 1975 US dollars.

Table 3

Percent

Average Annual Rate of Growth of Per Capita Consumption in Selected OECD Countries and the USSR

	1951-55[a]	1956-60	1961-65	1966-70	1971-75	1976-79	1951-79[a]
Total OECD	**NA**	**NA**	**3.7**	**3.7**	**2.8**	**3.1**	**NA**
Of which							
Canada	2.5	2.1	2.6	2.7	5.2	2.4	2.9
United States	1.5	1.0	2.8	2.7	2.0	3.4	2.2
Japan	7.0	6.8	7.9	8.6	4.8	3.9	6.6
Australia	0.4	0.9	2.5	2.9	2.5	1.1	1.7
New Zealand	NA	NA	1.5	0	1.2	0.1	0.7
Finland	3.7	2.0	5.0	4.1	3.6	1.5	3.4
France	3.7	3.2	4.5	4.0	4.1	3.6	3.9
West Germany	8.1	5.5	4.1	4.0	2.6	3.7	4.6
Italy	3.9	4.1	5.3	6.1	1.8	2.6	4.0
Netherlands	3.4	2.3	4.9	4.9	2.3	3.3	3.5
Norway	1.8	2.2	2.6	2.9	3.2	1.9	2.5
Spain	4.6	1.5	7.3	4.8	4.8	1.6	4.1
Sweden	1.8	1.8	3.6	2.3	2.3	0.9	2.2
Switzerland	1.4	2.3	3.1	3.0	1.4	2.1	2.2
Turkey	5.4	1.9	1.8	3.0	4.5	1.7	3.1
United Kingdom	3.9	2.2	2.0	1.6	2.0	2.4	2.2
USSR	**3.1**	**3.8**	**2.1**	**4.3**	**2.6**	**1.7**	**3.0**

[a] Data in column 1 for Japan and the United Kingdom are for 1953-55; for Finland, France, West Germany, Italy, and the Netherlands—1952-55; and for Spain—1955 only. The corresponding data in column 7 are for 1953-79, 1952-79, and 1955-79, respectively. The value in column 7 for New Zealand is for 1961-79.

NA = not available.

Sources: See sources to table 1 for the OECD consumption data. The USSR consumption data are from table A-9. The population data for all countries are from *World Population 1979*, US Bureau of the Census, Government Printing Office, Washington, D.C., 1980, and *Demographic Estimates for Countries With a Population of 10 Million or More: 1981*, US Bureau of the Census, Government Printing Office, Washington, D.C. 1981, and *World Population 1977*, US Bureau of the Census, Government Printing Office, Washington, D.C., 1978.

the share allocated to consumption has decreased by 7 percentage points. The only other country to have a similar change in output-use patterns is Japan, where investment has risen from 15 to 33 percent of GDP, while private consumption has fallen from 63 to 55 percent. Most of the other OECD countries show either stable patterns of distribution or shifts from private consumption to other (mostly government) expenditures.

Growth in Per Capita Consumption. Table 3 compares the average annual growth rates of per capita consumption for selected OECD countries and the USSR. There is considerable variance among countries and time periods. The USSR compares quite favorably with most OECD countries but lags well behind Japan and West Germany. Declining Soviet growth shows up clearly in the Soviet data, with the growth rate of per capita consumption falling to 1.7 percent per year in 1976-79.

Table 4
Percentage Distribution of 1960 and 1976 Soviet GNP by Sector of Origin in Current and 1970 Established Prices

Sector	1960		1976	
	1960 Prices	1970 Prices	1970 Prices	1976 Prices
Industry	47.2	42.1	47.9	48.9
Construction	7.1	7.3	8.0	7.9
Agriculture	17.5	25.1	16.8	16.1
Transportation	7.2	5.8	7.9	8.4
Communications	0.6	0.5	0.8	0.8
Trade	4.6	4.5	5.0	4.9
Services	13.0	12.0	11.5	11.1
Other	2.8	2.6	1.9	1.9

Sources: The data in 1970 prices are derived by using the indexes in table A-5 and the established-price weights in table D-7. The methodology is described in appendix A. See footnote 28 for the data in 1960 and 1976 prices.

How Reliable Are the Synthetic Measures of Soviet Growth?

The data used above to describe and interpret Soviet economic growth since 1950 are based on conventional Western national income concepts. While they rely on published official Soviet data, they reflect numerous judgments about both the meaning of Soviet data and the best procedures for constructing the Western-style accounts. The reliability and sensitivity of the synthetic GNP data can be examined in terms of the: (1) sensitivity of the growth rate of GNP to the base year used, (2) patterns in the residual component of the accounts, (3) comparison with official Soviet NMP data, and (4) comparison with other Western estimates of Soviet GNP.

Sensitivity to the Base Year Used

When the prices of one year are used to measure growth over a 30-year span, growth rates in years far from the base year can be distorted because of changes in intersectoral price relationships.[27] As a check on the severity of this problem, current-price GNP accounts for the USSR were constructed for 1960 and 1976.[28] The distribution of GNP by sector of origin in 1960 and 1976 in current and 1970 established prices is compared in table 4.[29] In 1960 the primary difference is that agriculture has a lower weight in 1960 prices than in 1970 prices, a result which reflects the fact that price increases for agricultural output between 1960 and 1970 were greater than those for other sectors.

The rates of growth of GNP obtained by using 1960, 1970, and 1976 as a base year are compared in the following tabulation:

Average Annual Percent Growth of GNP

Period	1960 Prices	1970 Prices	1976 Prices
1951-60	6.6	6.2	6.1
1961-70	5.5	5.3	5.2
1971-80	3.4	3.2	3.1

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[27] Bergson concludes that the long-term decline of the Soviet GNP growth rate is understated on this account. See Abram Bergson, "Conclusions," *The USSR in the 1980s*, NATO-Directorate of Economic Affairs, NATO, Brussels, 1978, pp. 231-242.

[28] These accounts are not included in this report, but were constructed using the same methodology as described in this report for 1970.

[29] Because of the problems inherent in using Soviet-established prices for measuring the growth of GNP (discussed in part II) a more informative comparison would be in factor-cost prices. At this time, however, data for 1960 and 1976 in current factor-cost prices are not available.

The data clearly show that Soviet GNP grows more rapidly when measured in 1960 prices than in 1970 prices, but that the differences are not large. The use of 1976 prices appears to make little difference in the growth rate of GNP compared to 1970 prices.[30]

Patterns in the GNP Residual

In the 1970 GNP accounts for the Soviet Union, certain expenditures cannot be identified explicitly. These outlays not elsewhere classified (n.e.c.) comprise a residual component within the base-year accounts. Conceptually, this category includes defense expenditures n.e.c., changes in strategic reserves, other unidentified expenditures, and a statistical discrepancy. In addition, we have not been able to calculate constant-price indexes of inventory change or net exports; therefore, both of these quantities are also conceptually part of the outlays n.e.c. component in the time-series data. Outlays n.e.c. is calculated as a residual. Total GNP is derived from the sector-of-origin data. Then the sum of identified end-use components is subtracted from total GNP. The resulting value is outlays n.e.c.

Since total GNP should be the same regardless of whether it is calculated as the sum of the sector-of-origin or of the end-use components, the reliability of our GNP estimates can be assessed by examining the level and the trend in the residual component. The level of outlays n.e.c. should be well above zero. Although inventory change and net exports can be negative, the other elements of outlays n.e.c. (mainly some defense expenditures) should be sufficiently large to ensure that total outlays n.e.c. is positive. The reasonableness of the trend in the residual can be checked by using some additional data and making some strong assumptions about defense expenditures. Data are available on a large share of inventory change in current prices, but a suitable deflator is not. The fluctuations in this component of outlays n.e.c., however, generally should be in the same direction in both constant and current prices.

The Soviet foreign trade statistical handbook, *Vneshnyaya torgovlya SSSR v 19—godu*, now publishes volume indexes of exports and imports. For the purpose of this exercise, we can assume that these indexes are accurate reflections of exports and imports in 1970 prices.

Although total defense expenditures are estimated to have grown at 4 to 5 percent per year since 1965,[31] the portion included in outlays n.e.c. may have increased at a quite different rate. Nevertheless, for the purpose of this exercise, it is assumed that all of the unidentified expenditures in the base-year accounts are defense expenditures and that they have increased at a rate of 4.5 percent per year since 1965.

The sum of inventory change in current prices and net exports and partial defense expenditures in constant prices provides a synthetic measure of outlays n.e.c. which should indicate whether the actual trend in outlays n.e.c. is plausible. The ruble values of the synthetic measure and the actual outlays n.e.c. component of end-use GNP are compared in figure 7. The year-to-year changes in the synthetic measure usually are in the same direction as changes in outlays n.e.c. until 1978; therefore, outlays n.e.c. appears to be a reasonable reflection of those expenditures that cannot be explicitly identified. The synthetic measure shows an upward trend while outlays n.e.c. shows little change prior to 1978. The difference in the trends can be interpreted as an indication of the existence of inflation. The imprecision in all of the data underlying this comparison, however, precludes any inference about the actual rate of inflation.

After 1978, outlays n.e.c. decrease rapidly and become implausibly low to represent a large portion of defense expenditures plus inventory change and net exports. The cause of this decline is not known. Arithmetically, it could result from an underestimate of the growth of GNP or an overestimate of the growth of the other end-use components.

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[30] This comparison may understate somewhat the sensitivity to the base year used because the same activity indexes were used with all three sets of weights. If the indexes were recalculated using 1960 or 1976 prices to combine their various subindexes, then the difference in the average GNP growth rate probably would be increased slightly.

[31] See footnote 24.

Figure 7
The Outlays n.e.c. Residual and a Synthetic Measure

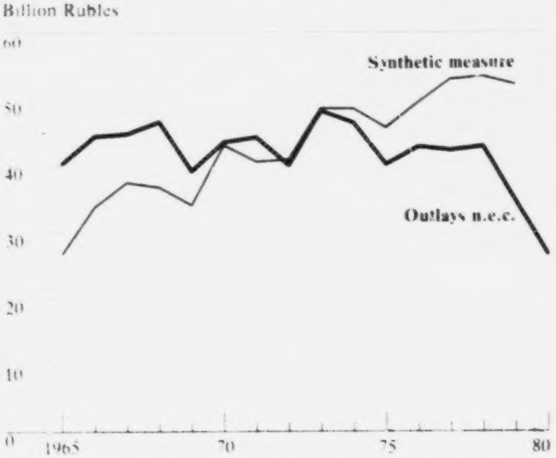
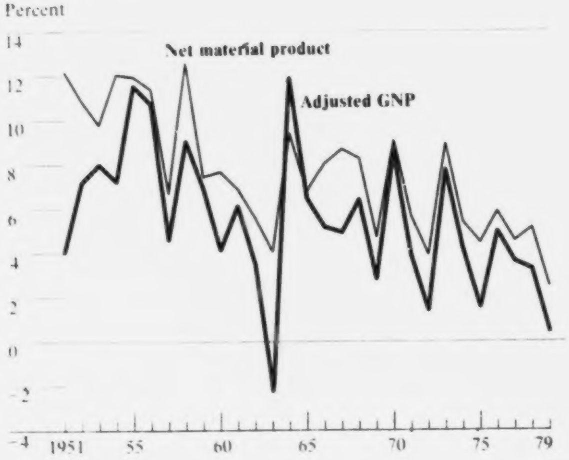


Figure 8
Annual Growth Rates of Soviet Adjusted GNP and Net Material Product



Comparisons With Official Soviet Data
Another assessment of the reliability of our GNP accounts can be made by comparing the official Soviet NMP data in constant prices with a synthetic measure of NMP derived from the GNP accounts. NMP measures the value added (less depreciation) in industry, construction, agriculture, freight transportation, business communications, trade, and "other branches" of material production. The synthetic measure of NMP constructed here consists of the entire value added in industry, construction, agriculture, trade, general agricultural programs, and forestry, and part of the value added of transportation and communications.

Figure 8 compares the annual growth rates of NMP in constant prices and the synthetic measure derived from our GNP data. Average annual growth rates by five-year periods are shown in the following tabulation:

Five-Year Period	Average Annual Percent Growth	
	Adjusted GNP	Net Material Product
1951-55	7.6	11.1
1956-60	7.1	9.1
1961-65	5.1	6.5
1966-70	5.6	7.7
1971-75	3.7	5.7
1976-80	2.6	4.2

The results show that the synthetic measure grows more slowly than NMP but that the pattern of annual fluctuations is quite close to that of the Soviet measure in constant prices. This result suggests that the fluctuations in Soviet GNP are captured fairly accurately in our data. The continued close relationship of both measures after 1978 suggests that our estimates of the growth rate of total GNP are accurate, and that the apparent underestimate of outlays n.e.c. after 1978 noted above results from an overestimate of other end-use components.

Comparisons With Other Western Estimates

A number of other estimates of Soviet GNP have been compiled by Western scholars, although none is as comprehensive or recent as those presented here. Most of these estimates concern the 1950s or early 1960s. The tabulation below compares the average annual rate of growth of total GNP derived in these other Western studies with the corresponding value derived in this study: [illegible]

Period	Other Western Studies of Soviet GNP		Average Annual Rate of Growth Derived in This Study (Percent)
	Author	Average Annual Rate of Growth (Percent)	
1951-55	Bergson	7.6	5.5
1951-61	Moorsteen and Powell	7.4	5.7
1951-65	Kaplan	6.3	5.5
1951-69	Cohn	5.5	5.3
1956-75	Lee	7.7	5.0
1959-64	Becker	5.8	4.8

It is readily apparent that in each case the growth rate derived in this study is lower, and in some cases the difference is considerable. The studies by Bergson, Becker, and Lee estimate the growth of GNP as the sum of end-use expenditures. About 60 percent of the difference between the growth rates computed by Becker and in this study arises from the lower growth rate of consumption derived here (4.7 versus 3.5 percent per year). This difference in turn results largely from Becker's use of Soviet price indexes to deflate the retail sales data as opposed to the use of physical quantity consumption and production data in this study. Similarly, most of the difference between Bergson's estimate and the one obtained here is the much lower growth rate of consumption derived in this study. Again, Bergson uses Soviet price indexes to deflate the retail sales component of consumption. Lee's data are essentially in current prices and this undoubtedly accounts for most of the difference between his results and those obtained here.

The studies by Moorsteen and Powell, Kaplan, and Cohn all use a set of base-year, sector-of-origin weights and a set of corresponding production indexes in order to estimate the growth rate of GNP. The growth rate obtained here is lower than that of Moorsteen and Powell primarily because of different weights. The 1950 implicit weights for industry (a high-growth sector) in this study are lower and the weights for agriculture and housing (low-growth sectors) are higher. The Kaplan growth rate is higher mainly because industry is assigned a higher weight and the average growth rate of industry is a full percentage point higher. The Cohn growth rate is nearly the same as the one obtained here.

[illegible] Bergson, 1961, p. 149; Moorsteen and Powell, *Soviet Capital Stock*, pp. 623-624; Kaplan, *Soviet Economic Growth*, p. 14; Cohn, "Growth of the Soviet Economy," p. 17; W. T. Lee, "USSR Gross National Product," p. 413; and Becker, 1969, p. 128.

Part II
Methodology

The estimation of Soviet GNP and its change over time presents several thorny methodological problems. This part first summarizes the major issues in formulating an accounting structure and devising a set of synthetic prices that will be in accord with the Western theoretical model of national income valuation and growth measurement. A discussion of the construction of our 1970 base-year accounts using Soviet official prices and their conversion to our synthetic prices follows.

Having described the base-year accounts, the discussion then shifts to the methodological problems involved in measuring the growth of Soviet GNP over time. The central problem is how to measure the real growth of a diverse collection of goods and services when the relative prices and quantities are shifting. Index number theory tells us that there is no single answer to this question. A summary of the problem is provided here with additional discussion of a few specific problems that are particularly serious in the Soviet case. Finally, all of the indexes used to measure the growth of the various components of GNP by sector of origin and end use and their underlying methodologies are described.

The Accounting Framework

The accounts used to compute GNP are partially determined by the institutional structure of the country involved. This section first describes the accounting units that comprise the Soviet economy and then describes the main financial flows involving these units. Next a number of definitional problems are considered and the resulting differences between the US GNP accounts and those constructed here for the Soviet Union are discussed.

The Accounting Units

There are four important types of accounting units in the USSR. The first two are *khozraschet* enterprises and so-called budget institutions, both of which are state organizations. The other two are the collective farm (*kolkhoz*), which is part state and part cooperative, and the private household.

Khozraschet Enterprises. A *khozraschet* enterprise is a state organization that operates on a profit-and loss-basis. It sells its output, uses the proceeds to purchase its inputs, and thereby obtains a profit or loss. The enterprise, however, must regulate production in conformity with the highly detailed state economic plan and is in other ways directly administered by the government. Although it differs operationally from a private corporation in the United States, a *khozraschet* enterprise, when viewed from a GNP accounting standpoint, is similar to and treated much like a private corporation. It is similar in that the financial relations between a *khozraschet* enterprise and the state are conducted on a net rather than a gross basis. The enterprise is expected to be managed sufficiently well to obtain enough profits to finance certain activities, and the amount of government revenues obtained from the enterprise depends on its performance.[11]

An enterprise's profit is disposed of according to administrative rules. Most profits go to the state budget, much like an income tax in the United States. In 1970, for example, 59 percent of the profits of *khozraschet* enterprises were turned over to the budget. The government takes such a large share of the profits because it is directly involved in the capital transactions of *khozraschet* enterprises, contrary to the situation in a private US corporation. Most capital investment is paid for by allocations from the state budget. Retained profits of enterprises are used not only for capital investment, but also for a variety of managerial incentives, employee welfare, and other purposes. Indeed, some of the incentive funds are considered to be labor payments in GNP accounting rather than profits.

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[11] It should not be forgotten that a *khozraschet* enterprise is a state organization. All of its capital stock is state owned and can be taken away without compensation, just as the profits derived from the operation of the state-owned assets also can be taken away. The director of an enterprise is appointed by the state and is charged with fulfillment in the most economical manner of the production plan assigned to the enterprise.

Although *khozraschet* enterprises normally are expected to be profitable, many cannot be so under existing prices. For example, many meat and milk processing enterprises must be subsidized heavily because the government has repeatedly raised procurement prices for many agricultural products while holding their retail prices constant.[34]

Budget Institutions. A budget institution receives the funds necessary for its current operations from the state budget and returns any receipts accruing from its operations to the budget. Budget institutions tend to be organizations conducting government administrative operations or providing services to the population at little or no direct charge. Government administration is carried out by organizations such as the State Planning Committee (Gosplan), the Central Statistical Administration, the Ministry of Defense, and municipal government organizations. Organizations producing consumer services include the health and education ministries, which collect only modest fees, and the municipal service organizations, some of which are expected to collect sufficient fees to offset most of their current expenses.

In general, the accounts of budget institutions are less detailed than those of *khozraschet* enterprises. In particular, depreciation allowances are not charged as a current expense. The *Narkhoz*, therefore, does not include depreciation of the capital stock of budget institutions in its depreciation data.

Budget institutions play a large role in the Soviet economy. According to Soviet capital stock data, budget institutions possessed capital valued at 102.4 billion rubles on 1 January 1973, 10 percent of the total. It is likely that 20 to 25 percent of the labor force is employed in budget institutions, although exact data are not available. The borderline between budget and *khozraschet* enterprises has been a shifting one, but there has been a long-run tendency to increase the sphere of *khozraschet* enterprises in order to achieve greater control and efficiency.

Collective Farms. In the USSR the collective farm, or *kolkhoz*, is part state and part cooperative. The land is state owned but given rent free to the *kolkhoz*. Members of the collective supposedly elect the director, and the net proceeds from farm activities are distributed to the members. In fact, the *kolkhoz* is now very similar to a state farm, or *sovkhoz*. The director is for all practical purposes appointed by the state, the state assigns a production and procurement plan, and the *kolkhoz* member is now guaranteed payment for his labor under a wage system like that of state farms.

For accounting purposes, however, *kolkhozy* present several problems. Financial data in the *Narkhoz* and other sources tend to report only on state organizations, omitting *kolkhoz* statistics. *Kolkhoz* accounts, therefore, have to be compiled from scattered sources. For example, earnings are retained and used for investment but are not included in Soviet data on profits. In addition, *kolkhozy* perform a considerable amount of industrial and construction work that is difficult to quantify. As a result, our estimate of agricultural value added is probably overstated somewhat.

Private Households. The final accounting unit in the reconstructed GNP accounts for the Soviet Union is the private household. Private citizens carry out production, consumption, and investment activities. Their production is centered in agriculture, housing, and other services. In agriculture, production from private plots is sold and consumed in kind. Households contribute to the construction component of GNP by sector of origin through private housing construction, and they provide numerous services, including repair and personal care, education, health, recreation, and housing repair services. The operation of owner-occupied housing is included in the housing sector.

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[34] See Vladimir G. Treml, *Agricultural Subsidies in the Soviet Union*, US Department of Commerce, Bureau of the Census, Foreign Economic Report No. 15, Washington, D.C., 1978, for estimates of the size, growth, and distribution of this subsidy.

The Main Financial Flows

The nature of the accounting units determines the main financial flows used in the GNP accounts. For each type of unit incomes and outlays can be listed. The output of a *khozraschet* enterprise is sold to other enterprises for use in current production or is allocated to one of the end uses: private consumption, investment, government consumption, or exports. A *khozraschet* enterprise buys goods and services for its own production needs and spends some of the funds at its disposal on wages, social insurance contributions, depreciation and taxes. Sales less expenses equal profits and other net income. These financial flows are listed below:

Khozraschet Enterprise Income and Outlay Account

Outlays	Incomes
1.1 Goods and services	1.11 Sales to other enterprises on current account
1.2 Wages	1.12 Sales to private consumption
1.3 Social insurance	1.13 Sales to investment
1.4 Depreciation	1.14 Sales to government consumption
1.5 Indirect taxes	1.15 Sales to export
1.6 Retained profits	
1.7 Profits paid to the state budget	
1.8 Special charges for education, research and development, and other	
1.9 Miscellaneous charges	
1.10 Subsidies received (negative value)	

A budget institution normally does not sell its output; instead it receives its funds through the state budget. In the US GNP accounts, the output of a government organization is valued as the sum of its current operational expenditures. A Soviet budget institution is treated in the same manner here. The deficiency in this approach, as is the case in the US accounts, is its failure to take account of the contributions of fixed and working capital. The income and outlay accounts of a budget institution are as follows:

Budget Institution Income and Outlay Account

Outlays	Incomes
2.1 Goods and services	2.7 Budget allocation for operating expenditures
2.2 Wages	2.8 Sales for intermediate consumption to enterprises
2.3 Military pay	2.9 Sales to consumers
2.4 Military subsistence	
2.5 Social insurance	
2.6 Sales receipts (transfer to budget)	

There is some double counting here for institutions that sell some goods or services, because the list of incomes includes both sales receipts and the entire budget allocation. The sales receipts are also listed as an outlay (item 2.6) when they are transferred to the state budget. An example is a theater or museum that operates on budgetary allocations but collects admission fees. The admission fees would be listed both as an income under item 2.9 and as an outlay under item 2.6.

Constructing accounts for the *kolkhozy* is more difficult because of the scarcity of relevant data. *Kolkhoz* output is either sold to state procurement agencies, sold directly to state enterprises, sold in *kolkhoz* village markets, or distributed to members of the collective. In addition, the *kolkhoz* is expected to pay depreciation and to make sufficient profits to cover investment needs and pay taxes. These flows are outlined below:

Kolkhoz Income and Outlay Account

Outlays	Incomes
3.1 Goods and services	3.9 Sales to procurement organizations for resale
3.2 Money wages of *kolkhoz* members	3.10 Sales for consumption
3.3 Money wages of hired workers	3.11 In kind distributions to *kolkhoz* members
3.4 Social insurance	3.12 Sales to *kolkhoz* markets
3.5 Depreciation	
3.6 Taxes	
3.7 In kind distributions to *kolkhoz* members	
3.8 Retained income	

The private household account is concerned with the production of goods and services, as well as with consumption and investment. As producers, households sell agricultural production from their private plots, rent their owner-occupied housing to themselves, sell various services, and sell newly constructed housing. Some of the values in the account are imputed rather than monetary flows. An example is imputed rent of owner-occupied housing, which is based on the rental rate for state-owned housing and estimated expenditures for maintenance. Household financial flows are categorized as follows:

Household Income and Outlay Account

Outlays	Incomes
4.1 Goods and services	4.8 Rent of owner-occupied housing
4.2 Net earnings from sales of goods and services	4.9 Sales of services
4.3 Imputed wages	4.10 Sales of new housing
4.4 Imputed net rent	4.11 Sales of agricultural products to the state and private consumption
4.5 Consumption in kind of private plot output	4.12 Imputed sales of in kind consumption of private plot output
4.6 Investment in kind of livestock	4.13 Imputed sales of in kind investment in livestock
4.7 Imputed earnings from private housing construction	

Definitions and Conventions

Sector Classifications. Three measures of GNP are calculated, based alternatively on end use, income flows, and sector of origin. The end uses are, as in Western accounts, consumption, investment, government, and net exports. The detailed end-use categories are listed in figure 9. Consumption is divided into goods and services. Goods comprise four types of food (animal products, basic foods, processed foods, and beverages), soft goods, and durables. Services comprise housing rents (cash and imputed), utilities, transportation, communications, repair and personal care, recreation, education, and health. Some services are purchased by consumers, and some are partly paid for by the government.[11] Other services either are not available to Soviet consumers, or there are no data with which to estimate them. For example, financial and real estate services furnished to households are negligible, and privately supplied services of lawyers, doctors, dentists, and teachers cannot be estimated adequately, especially over time. Our 1970 weights, however, do include some estimates of private health and educational services.

Figure 9

Soviet End-Use and Sector-of-Origin GNP Categories

End-Use Categories

- Consumption
  - Consumer goods
    - Food
      - Animal products
      - Processed foods
      - Basic foods
      - Beverages
    - Soft goods
    - Durables
  - Consumer services
    - Housing
    - Utilities
    - Transportation
    - Communications
    - Repair and personal care
    - Recreation
    - Education
    - Health
- Investment
  - New fixed investment
    - Machinery and equipment
    - Construction and other capital outlays
    - Net additions to livestock
  - Capital repair
- Other government expenditures
  - Government administrative services
    - General agricultural programs
    - Forestry
    - State administration and the administrative organs of social organizations
    - Culture
    - Municipal services
    - Civilian police
  - Research and development
  - Outlays n.e.c.

Sector-of-Origin Categories

- Industry
  - Ferrous metals
  - Nonferrous metals
  - Fuel
  - Electric power
  - Machinery
  - Chemicals
  - Wood, pulp, and paper
  - Construction materials
  - Light industry
  - Food industry
  - Other industry
- Construction
- Agriculture
- Transportation
- Communications
- Trade
- Services
  - Housing
  - Utilities
  - Repair and personal care
  - Recreation
  - Education
  - Health
  - Science
  - Credit and insurance
  - Government administrative services
    - General agricultural programs
    - Forestry
    - State administration and the administrative organs of social organizations
    - Culture
    - Municipal services
    - Civilian police
- Military personnel
- Other branches

Soviet investment differs from the end-use category in the US GNP accounts by the inclusion of investment in kind in livestock and expenditures on capital repair. Contrary to Western practice, the Soviets make depreciation deductions for capital repair and account for these expenditures separately from current repair. In the United States, some repairs of this sort are considered current expense and not included in GNP; others are capitalized and included with new fixed investment. The Soviet investment expenditures reported in the *Narkhoz* include investment by state enterprises, the government, and *kolkhozy* for machinery and equipment, construction-installation work, design work, and other capital outlays, and also investment by private households for housing. New fixed investment, as defined in the reconstructed GNP accounts for the USSR, also includes net additions to livestock, which are part of inventory investment in the US accounts. In contrast to the United States, the Soviets include the cost of installing machinery in construction expenditures. These expenses would be part of investment in machinery in the United States.

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[11] See JEC, *Consumption*, for a discussion of the rationale for including government-paid services with consumption.

Because of the different scope of government activity in the Soviet Union, government expenditures are treated somewhat differently than in US GNP. The Soviet Government provides a wide range of consumer services without charge. Government current expenditures for health, education, and recreational services are classified here as consumption rather than as government expenditures. The government, through the state budget, also purchases a large share of the investment goods and distributes them to various organizations. These expenditures are treated as investment rather than as government expenditures. Investment in the US accounts includes only private investment; government investment is included in government expenditures. Included in government expenditures for the USSR are current outlays for government administrative services, research and development, and a part of defense expenditures. Government administrative services in turn consist of outlays on cultural activities, municipal services, civilian police, general agricultural programs, forestry, and state administration and the administrative organs of social organizations.

The second basis of classifying GNP is by type of income. This approach is not used in computing the growth of real GNP, but is used to construct the base-year GNP weights. The principal types of household incomes are state wages and salaries, *kolkhoz* money wage payments, net income from sales of farm products, consumption in kind of private agricultural production, earnings from private services, net rent from owner-occupied housing, and net income from construction of private housing. The principal types of income in the public sector are retained earnings, charges for special funds, taxes, depreciation, subsidies (as negative income), deductions from profits, and other payments to the budget.

The third basis of calculating GNP is by sector of origin, aggregating the income earned in each sector of production activity. The classification of the production of goods and services conforms to Soviet definitions: industry, construction, agriculture, transportation, communications, trade, and services. Industry is further broken down into 11 subsectors and services into nine. Military personnel and a small "other branches" sector complete the sectors of origin. The full list of sectors is shown in figure 9.

Each type of income earned in 1970 is allocated among the sectors of origin. The values assigned to each sector are then summed to form the 1970 weights for each sector. Each sector weight is then multiplied by a matching volume index to derive the estimated growth of real GNP.

Production Boundaries. The definition of a final good or service is not always clear in national income accounting. The main source of uncertainty is whether government expenditures should be considered final or intermediate output. The decision in Western practice has been to declare all government purchases of goods and services to be final output. The more extensive scope of government activity in the USSR makes definition of final output still more difficult. One major problem concerns science expenditures. In the United States, research and development is largely financed by private corporations, and their expenditures are considered intermediate purchases. The research and development funded by governments is considered final output, being treated as purchases from the various industries that perform research and development on government contract or as direct purchases of materials and wages of government employees. Accordingly, in the US accounts there is not a separate comprehensive account for research and development expenditures. In the Soviet Union, most science expenditures are funded by the government, and science is considered a separate sector. For practical reasons, then, all Soviet science expenditures are classified as final output in our GNP accounts. Expenditures funded by ministries and enterprises for the final development and implementation of production of new products are considered to be intermediate purchases.[16]

The value of services, such as health and education, that are paid for by enterprises presents a similar problem. In the United States, businesses normally pay for health and educational services directly connected with employment. Most Soviet health and education expenses are paid for by the government, but enterprises also are thought to pay significant amounts. Soviet data, however, do not identify which expenditures are for private consumption and which are incidental to the production of goods and services. In these accounts, we estimate the volume of enterprise payments in 1970 for education and then classify all educational services as final output, contrary to US practice.

Valuation of government services poses a question of comparability. In the United States, government services are valued at cost, as the sum of all current expenditures for materials, services, and wages. This procedure undervalues these services relative to privately provided services because there is no allowance for profits or depreciation. In estimating Soviet GNP, we have followed the same practice, but the more extensive nature of government services in the USSR leads to greater distortion on this account.

The Second Economy. The second, or unofficial, economy in the Soviet Union has grown rapidly, and both its size and significance are now discussed widely. Grossman asserts that the second economy constitutes a large share of the Soviet economy and that its incomplete accounting in GNP distorts measures of the size and distribution of Soviet output. Schroeder and Greenslade argue that the most important aspects of the second economy are already accounted for in the GNP accounts as presented here.[17] The term "second economy" normally is defined to encompass the entire range of private productive activity in the Soviet Union. Most of this activity is legal, including private agricultural production, private housing construction, and the sale of privately produced services such as health, education, and recreation. Although the present accounts attempt to cover this activity, in all likelihood they do not capture it completely.

In addition to the legal activities, a wide variety of illegal activities are carried on, including the theft and sale of state property and the illegal production of certain products, the most prominent of which is liquor.[18] The practice in the US accounts is to exclude illegal activities, and that rule is followed here.[19]

Imputations. Several imputations are necessary to account for production that takes place outside of normal buyer-seller relationships and, hence, does not have any monetary value assigned to it. In the Soviet Union, the prime categories of such activity are agricultural production consumed in kind, the value of food and clothing given to members of the armed forces, and the rental value of owner-occupied housing. The goal is to attach a value to these activities using the same prices for which equivalent goods are sold. Thus, the retail prices of food and clothing are used to value military subsistence, the average rent per square meter of state housing is used for estimating the rental value of owner-occupied housing, and the average realized selling price of each type of agricultural product is used to value agricultural output consumed in kind. Valuation of owner-occupied housing presents a special problem in that state-owned housing is heavily subsidized, and the procedure adopted here implicitly provides a similar subsidy for private housing. The quality of state housing may be superior to that of private housing, but the evidence is insufficient to make an adjustment.

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[16] The exact coverage of the Soviet official data on science expenditures is uncertain. In particular, some prototype production may not be included.

[17] Gregory Grossman, "The 'Second Economy' of the USSR," *Problems of Communism* 26, September-October 1977, pp. 25-40; and Gertrude E. Schroeder and Rush V. Greenslade, "On the Measurement of the Second Economy in the USSR," *ACES Bulletin* 21, spring 1979, pp. 3-21.

[18] An estimate of private production of liquor in the Soviet Union is in Vladimir G. Treml, "Production and Consumption of Alcoholic Beverages in the USSR: A Statistical Study," *Journal of Studies on Alcohol* 36, March 1975, pp. 285-320.

[19] The effects of illegal activities on GNP are discussed in Edward F. Denison, "Effects of Selected Changes in the Institutional and Human Environment Upon Output Per Unit of Input," *Survey of Current Business* 58, January 1978, pp. 37-42.

Summary of Differences in the Soviet and US GNP Accounts

As discussed above, the structural characteristics of the Soviet economy have made it necessary to construct a set of GNP accounts that differ somewhat from the US accounts. In addition, the lack of data forces some simplification and consolidation of the Soviet accounts as compared with the US accounts. This section summarizes the structure of our Soviet GNP accounts and the differences between the Soviet and US accounts.

Three interrelated accounts comprise our Soviet GNP accounting system. The first is the household account. It enumerates the various incomes and outlays, including imputed, of private households. The household sector is defined to include all activity by households. That is, investment and current production activity are included as well as consumption and transfer payments.

The second account shows the incomes and outlays of the public sector. Because of lack of data, we are unable to differentiate between government final expenditures and production activities. As a result, public-sector outlays include government administrative expenditures as well as investment by *khozraschet* enterprises. Similarly, public-sector incomes include tax payments to the budget as well as retained earnings of *khozraschet* enterprises and *kolkhozy*.

The third account is the consolidated GNP account. It includes the incomes and expenditures resulting from current production activity. The various transfer payments between the household and public sectors are excluded since they do not represent expenditures for goods and services. All of the incomes and outlays are derived from the relevant portions of the household and public-sector accounts.

The household and public-sector income and outlay accounts for 1970 are presented in appendix D. The GNP account is discussed in more detail below.

The US GNP accounts consist of five accounts. The first account shows personal incomes and outlays. It resembles the Soviet household income and outlay account presented above. The main differences between the accounts are the explicit inclusion of agricultural income in kind and private investment in the Soviet account. Agricultural income in kind is included in the US account, but its importance is small and it does not appear as a separate item. Private investment in the Soviet Union consists of private housing construction and the net addition of livestock to private herds. In the US accounts, these investment activities are considered part of the business sector and are included in gross private business investment.

The second US account shows government incomes and outlays. Because of the wide scope of Soviet Government activity and the lack of data to make adjustments, the Soviet GNP accounts merge the equivalent of the business sector with the government sector into an aggregate public sector. In particular, it is not possible to quantify separately government-financed investment and enterprise-financed investment.

The third US account is foreign trade. Foreign trade in the Soviet Union is a state monopoly and cannot be separated from the public sector for accounting purposes. Foreign trade in the Soviet accounts is, therefore, shown as a net item in public-sector outlays.

The fourth US account shows savings and investment. This account does not exist in the Soviet accounts because of the problem of separating enterprise investment from government investment. The fifth US account shows consolidated GNP as the sum of the relevant parts of the other four accounts.

Valuation

As is widely recognized, Soviet prices differ markedly in concept from Western scarcity prices. Accurate measurement of the growth of production potential requires the use of prices that come as close as possible to the theoretical standard—that is, the prices of any two products should be proportional to the marginal rate of transformation between the two products. The purpose of Bergson's adjusted factor-cost standard (AFCS) is to adjust Soviet prices so that they more closely approximate the theoretical standard. This section first examines the basic nature of Soviet prices and then describes Bergson's AFCS, its justification, and its limitations.

Soviet Established Prices

In most countries, GNP is computed only in terms of market prices. The related prices in the Soviet Union are the so-called established prices.[40] Most prices in the Soviet Union are established by administrative decision rather than by market forces. They are intended to cover material costs, wages, depreciation allowances, social security allowances, other direct costs, and a profit surcharge—in other words, average cost plus a profit markup. While the profit surcharges are intended to average about 15 percent of the stock of fixed and working capital, in practice they are computed as a percentage of input costs. The costs computed are those that would be incurred by an average enterprise producing according to required standards and following normal procedures, rather than the actual production costs of any one enterprise. Thus some enterprises should make above-average profits because of better-than-average production conditions, while other enterprises will make less-than-average profits or even losses. This method of price formation, however, does not apply to all prices. Agricultural prices include a bewildering array of procurement, above-plan procurement, direct delivery, zonal, and collective-farm-market prices. The construction industry does not have a standard product; hence, its prices are formed on a cost plus basis for each construction project.

The profits included in Soviet prices are intended to cover the normal uses to which an enterprise is allowed to put its profits while leaving enough for the needs of the state budget. Since the economic reforms in the late 1960s, the enterprises have been allowed to form increased material incentive and other funds from profits and have had to pay a charge to the state for the use of enterprise capital stock. The allowance for profits has, therefore, been increased.

Established prices in the USSR have several aspects that make them unsuitable as weights in computing the real growth of the Soviet economy. These aspects include large turnover taxes (levied primarily on consumer goods), rapidly growing subsidies on housing and industrial purchases of agricultural goods, widely varying profit rates when computed as a return to capital, differential prices for the same good, and inflated prices of new products. Each of these problems will be discussed briefly.

Finding a Basis for Valuing Soviet GNP

The important uses of national income statistics include the analysis of resource allocation and the measurement of the growth of economic production capability. A considerable amount of Western literature centers on measurement of national income for these purposes and on what can or cannot be implied from the results.[41] In practice, Western countries construct GNP accounts using existing market prices as if they met the theoretical requirements for use in measuring resource allocation or economic growth. Although the requirements are never perfectly met, market prices of most Western industrialized countries fit the theoretical model reasonably well, so that the distortions probably are small.

The Soviet Union's centrally established and frequently arbitrary prices diverge greatly from the theoretical model. The principal requirements of this model are that the relative prices of two goods should be equal to their relative marginal costs and that the rate of return to each factor of production should be equal in all of its uses. Soviet procedures for price formation violate these requirements. A price based on the average direct cost of all enterprises producing a product does not allow for the differential cost of the capital resources being used, for the different utility that two products of equal cost may have, or for the relative scarcity of the inputs used to produce the product. Since demand has little or no effect on prices, some goods will be in abundant supply while others are rationed.

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[40] The term "prevailing prices" is also used in Western literature. See Bergson, 1961.

[41] Among the classic articles are: J. R. Hicks, "The Valuation of Social Income," *Economica* 7, May 1940, pp. 105-124; Simon Kuznets, "On the Valuation of Social Income," *Economica* 15, February-May 1948, pp. 1-16, 116-131; J. R. Hicks, "On the Valuation of Social Income," *Economica* 15, August 1948, pp. 163-172; P. A. Samuelson, "Evaluation of Real National Income," *Oxford Economic Papers* 2, January 1950, pp. 1-29; and Richard H. Moorsteen, "On Measuring Productive Potential and Relative Efficiency," *Quarterly Journal of Economics* 75, February 1961, pp. 451-467.

Distortions Caused by Turnover Taxes and Subsidies
The turnover tax is one of the major sources of government income in the Soviet Union. It is effectively an excise tax levied selectively on various products, but mostly on consumer goods. It can be characterized as a tax on consumers' income, intended to soak up excess purchasing power and to restrain consumer demand. The often high incidence of the tax and its selective application are important reasons why Soviet prices do not fit the Western model which requires that price equal marginal cost. Table 5 shows selected data from the 1972 Soviet input-output table on the level and variability of the turnover tax.

Most of the taxes are levied on consumer goods, as indicated by the large amounts collected in the light and food industry sectors. The fuel taxes are an exception: most are collected on interindustrial sales and in some cases are extremely high. In the case of agriculture, the farms pay heavy taxes on fuel purchases while receiving a subsidy on electricity purchases.

The aggregate data in table 5 not only indicate a high variance in tax incidence, but also hide other differences. For example, the entire turnover tax revenue shown for machinery products arises from taxations of consumer goods, mainly automobiles (the tax accounts for 53 percent of consumption outlays for automobiles in purchasers' prices) and radioelectronics (15 percent). Within the food industry, no taxes are paid on the output of the fish, meat, dairy products, flour, and fruit and vegetable sectors. On the other hand, the tax amounts to 30 percent of the gross output of the sugar industry and 56 percent of the gross output of the "other foods" branch, which manufactures alcoholic beverages.

Clearly, wide variations in indirect tax rates weaken the usefulness of prices as a measure of production potential. The suggestion has been made that Soviet turnover taxes represent a surrogate factor charge to compensate for the other problems in Soviet prices. This issue has been discussed in detail by Becker and Bergson, both of whom rejected the argument.[42]

Table 5

Turnover Taxes as a Share of Gross Output in Industry, 1972

Sector	Turnover Taxes (billion rubles)	Gross Output (billion rubles)	Turnover Taxes as a Share of Gross Output (percent)
Metals	0.1	44.2	0.2
Fuel	5.9	39.2	15.1
Electric power	0.6	14.0	4.1
Machinery	4.3	117.1	3.7
Chemicals	1.1	29.6	3.7
Wood, pulp, and paper	0.2	25.5	0.9
Construction materials	0.4	25.0	1.4
Light industry	15.7	87.5	18.0
Food industry	26.2	126.2	20.8
Other industry	1.0	13.4	7.6

Source: Dimitri M. Gallik, Barry L. Kostinsky, and Vladimir G. Treml, *Input-Output Structure of the Soviet Economy: 1972*, Foreign Economic Report 18, US Department of Commerce, Bureau of the Census, Foreign Demographic Analysis Division, Washington, D.C.; forthcoming.

Subsidies also force a divergence between prices and marginal costs. In the 1967 price reform, the prices of natural resources such as coal, oil, gas, and ferrous and nonferrous ores were raised sharply in order to eliminate subsidies or to improve profit levels. Rising extraction costs since then have made once profitable branches unprofitable and led to renewed subsidies and the need to raise prices once again. In the coal industry, for example, profits have declined from 844 million rubles in 1970 to a loss of 626 million rubles in 1978.[43]

The most expensive subsidies are now paid on agricultural products. The Soviet Government has several times raised procurement prices for various agricultural products, notably meat and dairy products, in

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[42] Becker, 1969, pp. 47-49; and Bergson, 1961, pp. 105-108.
[43] *Narkhoz 1978*, p. 517.

Table 6 Billion Rubles

Subsidies on Agricultural Products Sold to the Light and Food Industries

Year	Light Industry	Food Industry
1966	0.3	3.3
1967	0.3	5.0
1968	0.3	7.3
1969	0.3	8.2
1970	1.7	13.0
1971	1.8	14.1
1972	2.0	15.2
1973	0.6	15.8
1974	0.2	17.3
1975	0.5	19.0

Source: Vladimir G. Treml, *Agricultural Subsidies in the Soviet Union*, US Department of Commerce, Washington, D.C., 1978, p. 9.

Table 7

Profits as a Percent of Productive Fixed and Working Capital in 1972

Industry	19.3
Electric power	10.2
Oil extraction	26.0
Oil refining	21.8
Gas	46.0
Goal	6.3
Ferrous metals	16.0
Chemicals	19.8
Machinery	20.2
Wood, pulp, and paper	17.7
Construction materials	11.8
Light industry	27.0
Food industry	24.5
Sugar	5.5
Meat	59.3
Transportation	12.7
River transport	12.2
Automobile transport	31.5
Communications	13.9

Source: Narkhoz 1975, pp. 728-29.

order to stimulate production and improve the quality of the Soviet diet. At the same time, the government has held retail prices constant. Therefore, it has had to subsidize the light and food industries increasingly to cover their higher costs.

The agricultural subsidy has grown rapidly and now amounts to more than 20 billion rubles per year. Selected data relating to the light and food industries make it clear that the food industry receives most of the subsidy (table 6). The price distortions resulting from the combined effects of turnover taxes and subsidies are most striking at a disaggregated level. Turnover taxes were 30 and 56 percent of the gross outputs of the sugar and other food branches in 1972, while subsidies represented a negative 48 and 22 percent of the gross outputs of the meat and dairy sectors. Thus the subsidies tend to reinforce rather than offset price distortions caused by turnover taxes.

Variations in Profit Rates

Profits of a *khozraschet* enterprise—as noted earlier—are not intended to serve the same purpose as profits in a Western business. Instead, they are a mechanism to obtain sufficient funds for centralized public expenditures, to provide material incentives to enterprise management, to measure performance of enterprise management, and to exercise fiscal and administrative control.

After the management reforms of 1965, the role of profits increased significantly. Reflecting this, total profits increased rapidly, from 37 billion rubles in 1965 to 87 billion rubles in 1970. Profits, however, are distributed quite unevenly among sectors, and the profit rate on fixed and working capital varies enormously (table 7). For this reason, profits do not appear to be a reliable indicator of the contribution of capital to production, a precondition for the use of established prices as a measure of production potential.

Moreover, much of the service sector does not earn profits because the enterprises are financed from the state budget. The lack of any charge for the use of capital stock in the service sphere undervalues the resources used to produce those services.

Differential Prices and New-Product Pricing

Not only do relative prices of Soviet goods and services not correspond to relative costs of resources used in their production, but the price of a product often varies according to purchaser. The price discrimination is sometimes accomplished by selective application of taxes and subsidies, and sometimes by charging different prices. The full extent of this price discrimination is not known, but it is especially prevalent in the fuel sector. The indirect consequence is a divergence in the relative prices of output from the value of resources used.

Once a product is in serial production in the USSR, its price rarely changes. This is due partly to bureaucratic inertia and partly to the convenience of price stability for planning and administration. To increase profits, many enterprises and ministries introduce new products that are new in name only. Creating a new product permits establishment of a new, higher price for essentially the same good and results in relative prices that do not reflect relative resource use and hence do not measure accurately the production potential of alternative economic activities. As with differential prices, we have insufficient information to account for this price distortion. Whenever possible, therefore, we use physical output data to measure changes in the level of output rather than deflated value data. While avoiding the new-product price problem, this method tends to understate quality change.[44]

The Adjusted Factor-Cost Standard

Because of the deficiencies of Soviet prices, Bergson concluded that established prices did not conform sufficiently well with the requirements of the theory of optimal resource allocation to permit their use in measuring the change in Soviet production potential over time or to study the resource allocation pattern adopted by the Soviet Union. As an alternative, he proposed his adjusted factor-cost standard.

For GNP to measure production potential, some strong assumptions are required: chiefly perfect competition, the absence of price distortions in factor markets, and the full use of all productive factors. If these conditions are met, then the economy will operate on its production-possibility frontier, where the production of any product cannot be increased unless the production of some other product is decreased and where the relative prices of the two products indicates the trade-off.

Bergson hypothesized that the Soviet economy does not operate on its production-possibility frontier, but rather on a feasibility locus which is well short of the frontier. This shortfall of production may result from bureaucratic inefficiency or from the misallocation of resources. Bergson further conjectured that the feasibility locus is broadly parallel to the production-possibility frontier.

Working from this hypothesis, Bergson derived a set of price rules that would be sufficient to measure the growth of production potential as represented by the feasibility locus. These rules form his AFCS. According to Bergson, if the feasibility locus were to approach the production-possibility frontier, then the AFCS would also approach the efficiency standard for valuing national income. Broadly speaking, the AFCS ensures that prices are equal to average cost and that factor prices are equal between markets and proportional to factor productivities.

In particular, the AFCS requires that the following statements be true:

- All product prices must resolve into charges for primary inputs; that is, for land, labor, and capital.
- The differences in wages among sectors represent differences in labor productivity and workers' disutility.
- Rent is charged for the use of superior land and other natural resources.
- The charge for capital consists of a depreciation allowance and an interest payment based on a rate of interest corresponding to the average level of capital productivity.[45]
- Commodity prices are uniform within a given market area.

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[44] This issue is discussed in more detail in *Comparing Planned and Actual Growth of Industrial Ouput in Centrally Planned Economies*, Central Intelligence Agency, National Foreign Assessment Center, Washington, D. C., 1980.

[45] There is a difference of opinion over whether capital stock should be valued gross or net of depreciation. The capital stock data used in this study are gross of depreciation.

It should be clear that the AFCS is an imperfect measure of production potential and that our empirical application of it is even more imperfect. The prices that we implicitly construct using the AFCS are not the equilibrium prices of Western national income theory, and the data do not exist to implement the AFCS with great precision. Nevertheless, the AFCS is to be preferred to Soviet established prices because it removes major price distortions and provides a better measure of changes in production potential and resource allocation than do Soviet prices.

Our application of the AFCS builds on the work by Bergson and Becker. Starting with established prices, they deleted turnover taxes and added subsidies to arrive at GNP by sector of origin at factor cost. The effect of these price changes was then estimated on the various components of GNP by end use. The same adjustments also are done here. The availability of reconstructed Soviet input-output tables, however, permits some improvement in the allocation of the adjustments among end-use sectors. In addition, we replace profits with a capital charge which is calculated as a percentage of each sector's stock of fixed and working capital, and extend our earlier use of the input-output tables by integrating the service sectors into the adjustment process.

Soviet GNP in 1970 in Established Prices and at Factor Cost

This section presents GNP accounts for the Soviet Union in 1970 in established prices and then converts the accounts to factor-cost prices, step by step:

- The 1970 accounts in established prices are elaborated into an input-output framework.
- A 1970 input-output table in producers' prices is estimated.
- A factor-cost repricing algorithm is developed and applied to the 1970 input-output table.

The Revised 1970 Soviet GNP Accounts

CIA's original estimates of the 1970 GNP accounts were published in 1975.[46] The revisions in those accounts to take account of new information are described in appendix D, and the revised accounts are summarized in tables 8 and 9. These accounts are based on an elaboration and recombination of the income and outlay flows described above. The income account (table 8) combines portions of the left-hand column in each of the individual accounts. Thus, state wages and salaries are the sum of items 1.2 and 2.2. Similarly, the expenditure account (table 9) shows data from the right-hand side of each set of accounts.

In order to estimate the relationship between established prices and factor-cost prices, it is necessary to identify the effect of a price change in one sector on the price level of all sectors. This is necessary because a change in value added, such as replacing profits by a capital charge, represents a price change. The device used for this purpose is an input-output (I-O) table. It shows the structure of each sector's purchases from and sales to each sector, which allows the direct and indirect effects of a price change to be traced. In order to use an I-O table, the data in tables 8 and 9 need to be disaggregated according to I-O definitions. The value-added quadrant of an I-O table identifies the types of income shown in table 8 with the sector in which it is produced (columns of the I-O table). Similarly GNP by end use (table 9) represents the final expenditures on final goods and services. The final-demand quadrant of the I-O table identifies these expenditures with the sectors from which they are purchased (rows of the I-O table). Both of these disaggregations are shown in appendix E.

Construction of the 1970 Input-Output Table and Conversion of the 1970 Accounts to Factor Cost

The construction of the 1970 input-output table proceeds in two steps. First, the established-price data are converted to producers' prices. Then the converted data are used with an I-O updating algorithm to estimate a 1970 I-O table in producers' prices based on the structure of the Soviet 1972 I-O table in producers' prices. Producers' prices are equal to established prices less turnover taxes, plus subsidies, less trade and transportation expenses on delivered products.[47] Producers' prices are used to estimate the 1970

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[46] CIA, *GNP 1970*

[47] For a detailed discussion of producers' prices, see Vladimir G. Treml et al., *Conversion of Soviet Input-Output Tables to Producers' Prices: The 1966 Reconstructed Table*, US Department of Commerce, Bureau of Economic Analysis, Foreign Economic Report No. 1, Washington, D.C., 1973.

Table 8 Billion Rubles

Gross National Product of the Soviet Union in Established Prices, by Type of Income, 1970

Wage bill	135.412
State wages and salaries	132.032
Military pay and allowances	3.380
Other and imputed income	62.251
Net income of households from agriculture	41.709
Military subsistence	3.200
Other money income currently earned and statistical discrepancy	10.598
Imputed net rent	1.080
Imputed value of owner-supplied construction services	0.579
Charges to economic enterprises for special funds	5.085
Education	0.400
Research	2.578
Social-cultural measures and sports activities	0.162
Militarized guards	0.880
Support for administration of higher echelons	1.065
Social insurance	9.436
Profits	89.154
State enterprises	79.591
Retained profits of state enterprises	26.481
Deductions from profits of state enterprises	53.110
Collective farms	7.852
Retained income of collective farms	7.186
Tax on income of collective farms	0.666
Consumer cooperatives	1.283
Retained profits of consumer cooperatives	0.821
Tax on income of consumer cooperatives	0.462
Other organizations	0.428
Retained profits of other organizations	0.321
Tax on income of other organizations	0.107
Depreciation	31.827
Turnover and other indirect taxes	77.732
Turnover taxes	53.346
Miscellaneous charges	24.386
Allowances for subsidized losses n.e.c.	−22.553
Gross national product	383.259

Source: Appendix D.

Table 9 Billion Rubles

Gross National Product of the Soviet Union in Established Prices, by End Use, 1970

Consumption	211.083
Goods	166.478
Food	107.926
Soft goods	44.294
Durables	14.258
Services	44.605
Housing	3.429
Utilities	3.478
Transportation	5.400
Communications	1.200
Repair and personal care	5.497
Recreation	2.608
Education	14.380
Health	8.613
Investment	109.220
New fixed investment	90.220
Machinery and equipment	26.053
Construction and other capital outlays	59.800
Net additions to livestock	4.367
Capital repair	19.000
Other public-sector expenditures	62.956
Government administrative services	9.030
General agricultural programs	1.004
Forestry	0.636
State administration and the administrative organs of social organizations	3.821
Municipal and related services	3.569
Culture	1.180
Municipal services	0.628
Civilian police	1.761
Research and development	10.343
Outlays n.e.c.	28.429
Net exports	0.961
Defense n.e.c., unidentified outlays, and statistical discrepancy	27.468
Inventories	15.154
Gross national product	383.259

Source: Appendix D.

I-O table because relative producers' prices are thought to be more stable over time than relative purchasers' prices.

Since Soviet I-O tables show only the productive sectors,[48] while the transportation and communications sectors furnished both productive (freight transportation) and nonproductive (passenger transportation) services, these GNP sectors must be disaggregated. In addition, to obtain a value-added quadrant in producers' prices, we must compute: (1) the implicit subsidies received and turnover taxes paid by each productive sector on its material purchases, (2) the nonproductive services purchased by each sector, and (3) the material purchases of the service sectors. These estimates are explained in more detail in appendix E.

The 1970 I-O table is estimated with the help of a least squares minimization algorithm. It estimates a 1970 I-O table in producers' prices that is as much like the actual 1972 table as possible, with the constraint that each row and column must sum to a predetermined amount. The row and column sums are determined as each sector's gross output less, respectively, its value added or final demand. See appendix E for further discussion of the algorithm and its rationale.

Many of the steps taken to compute the 1970 I-O table in producers' prices are part of the conversion to factor-cost prices, notably the elimination of turnover taxes and subsidies on final goods and services. The remaining steps eliminate the rest of turnover taxes and subsidies and replace profits with a uniform capital charge. In our earlier publication on the 1970 GNP accounts, the uniform capital charge was set at 12 percent of the sum of fixed and working capital. The present report follows the work of Brown, Hall, and Licari in applying I-O repricing algorithms, developed originally for East European I-O tables, to determine the interest rate.[49]

The repricing procedure or algorithm relies on a basic property of an I-O table: that the sum of the entries in a particular column must equal the sum of the entries in the corresponding row. That is, a sector's sales must equal its total expenses, including profits. This property, plus the distribution of each sector's sales described by an I-O table, provides the ability to relate an increase in the price of the output of one sector to increases in the costs of all sectors. Thus, equalizing the rate of return on each sector's fixed and working capital implies a given set of changes in relative prices, and the I-O table can be used to compute directly the required array of price changes.

A Comparison of Established and Factor-Cost Prices

Tables 10 and 11 compare the percentage distribution of GNP by end use and by sector of origin, in established prices and in factor-cost prices. As expected, the largest difference in the end-use distribution (table 10) is the increase in the share attributed to services, especially housing, when factor-cost prices are used. Expenditures on consumer services, which were 11.6 percent of GNP in established prices, are 19.5 percent of GNP in factor-cost prices. The housing share increases from 0.9 to 7.0 percent of GNP. The shares of most other services also rise.

The major reductions in GNP shares are in consumer goods, especially beverages, soft goods, and durables. These changes stem mainly from the elimination of turnover taxes. As a whole, however, the share of consumption is about the same in established prices (55.1 percent) as in factor-cost prices (54.2 percent). The share of investment is virtually unchanged by the use of factor-cost prices. Total investment is 28.5 percent of GNP in established prices and 28.2 percent in factor-cost prices, with the structure almost the same.

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[48] The Soviet Union divides its economy into productive and nonproductive sectors. Productive sectors are those which produce material goods (industry, construction, and agriculture) and those which are needed to deliver material goods to their final user (freight transportation, business communications, and wholesale and retail trade).

[49] Alan A. Brown, Owen P. Hall, and Joseph A. Licari, *Price Adjustment Models for Socialist Economies: Theory and Empirical Technique*, International Development Research Center, Bloomington, Ind., 1973.

Table 10 Percent

1970 Soviet Gross National Product by End Use

	Established Prices	Factor-Cost Prices
Consumption	55.1	54.2
Consumer goods	43.4	34.7
Food	28.2	25.5
Animal products	11.0	14.3
Processed foods	3.6	2.7
Basic foods	6.0	6.1
Beverages	7.5	2.4
Soft Goods	11.6	6.8
Durables	3.7	2.5
Consumer services	11.6	19.5
Housing	0.9	7.0
Utilities	0.9	1.0
Transportation	1.4	1.7
Communications	0.3	0.5
Repair and personal care	1.4	1.2
Recreation	0.7	1.0
Education	3.8	4.5
Health	2.2	2.6
Investment	28.5	28.2
New fixed investment	23.5	23.4
Machinery and equipment	6.8	6.7
Construction and other capital outlays	15.6	15.6
Net additions to livestock	1.1	1.2
Capital repair	5.0	4.8
Other public-sector expenditures	16.4	17.6
Government administrative services	2.4	2.8
Research and development	2.7	3.1
Outlays n.e.c.	11.4	11.6

Source: See text.

As regards changes in the distribution of GNP by sector of origin (table 11), the two sectors showing the largest increases in percentage shares of GNP as a result of repricing are trade (retail, wholesale, and agricultural procurement) and housing. The light and food industry sectors experienced the greatest decline in GNP shares, primarily because most of the turnover taxes are collected in those sectors.

Table 11 Percent

1970 Soviet Gross National Product by Sector of Origin

	Established Prices	Factor-Cost Prices
Industry	45.8	32.0
Ferrous metals	1.9	2.3
Nonferrous metals	1.2	1.3
Fuel	3.9	3.1
Electric power	1.5	2.2
Machinery	11.9	10.1
Chemicals	2.6	2.0
Wood, pulp, and paper	2.9	2.4
Construction materials	2.0	2.1
Light industry	8.7	2.5
Food industry	7.4	3.0
Other industry	1.7	0.9
Construction	7.4	7.3
Agriculture	20.5	21.1
Transportation	7.4	8.7
Communications	0.7	0.9
Trade	4.8	7.3
Services	11.4	20.5
Housing	0.9	7.2
Utilities	0.5	0.6
Repair and personal care	1.1	1.2
Recreation	0.5	0.8
Education	3.0	3.8
Health	1.6	2.0
Science	1.6	2.0
Credit and insurance	0.3	0.4
Government administrative services	1.9	2.5
General agricultural programs	0.2	0.3
Forestry	0.1	0.1
State administration and the administrative organs of social organizations	0.8	1.2
Culture	0.3	0.4
Municipal services	0.1	0.2
Civilian police	0.4	0.4
Military personnel	1.8	1.9
Other branches	0.3	0.3

Source: See text.

Problems in Estimating Volume Indexes of Economic Activity in the USSR

The real growth of Soviet GNP is computed by multiplying each of the 1970 sector-of-origin and end-use weights by an appropriate constant-price activity index. While use of this method is not unusual in OECD countries, it is more common to deflate current-price data. The lack of detailed Soviet price indexes and our distrust of those that do exist precludes that approach here.

The problems of estimating constant-price indexes have generated a voluminous amount of literature.[50] In connection with the presentation of our Soviet GNP indexes it is appropriate to summarize some of the general problems encountered in working with index numbers.

Effect of the Base Year on the Growth Rate

In the computation of GNP, the aggregation of physical quantities expressed in different units requires the use of prices as weights. Thus the growth of GNP between any two years in constant prices is the ratio of two summations of prices times quantities. If relative prices or quantities of the various goods and services produced in the two years are the same in each year, then it does not matter whether the prices of the first or second year are used for aggregation. In general, however, technological progress; changing endowments of land, labor, and capital; and other factors will cause changes in relative prices. In practice, then, the measured GNP growth rate will vary, depending on whether prices of the first or second year are used.

In computing a series of growth rates for a multiyear period, it is possible to use the prices of one year for all calculations or to use a moving price base. With a moving price base, the weights used to combine the constant-price volume indexes are different for each calculation. In this report, 1970 prices are used for all growth rate calculations. The primary reason for this approach is that the construction of current-year weighted (Paasche) indexes requires current-price GNP accounts for each year, information which is not currently available. In addition, Western practice is to use the base-year weighted (Laspeyres) index.[51]

For analysis of current trends, the base year should be reasonably close to the current year so that the base-year relative prices are not greatly different from those of the current year. For the Soviet Union, 1970 is sufficiently recent to qualify as Soviet prices have not changed much since then. The large energy price changes of 1973-74 make it more important to use a price base of 1975 or later for a Western economy.[52]

Aggregation of Quantity Indexes Instead of Deflated Value Indexes

There are two basic methods of computing a constant-price activity index of the output of a collection of goods or services. Assuming that observations are available on the quantities produced and the prices of each good or service, then the current-price output can be deflated by a price index, or a weighted quantity index can be computed. With full information, the result will be the same. For the year 0, let Q(0,1), . . . , Q(0,i), . . . , Q(0,N) be the physical quantities of the N goods produced in year 0 and p(0,1), . . . , p(0,i), . . . , p(0,N) the corresponding prices. Then the growth of output from year 0 to year t, expressed in current prices, is:

$$\frac{\sum_{i=1}^{N} Q(t,i)p(t,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)}$$

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[50] Some of the general sources are: Lawrence Grose, *Real Output Measurement in the United States National Income and Product Accounts*, US Department of Commerce, Washington, D.C., 1967; T. P. Hill, *The Measurement of Real Product*, The Organization for Economic Cooperation and Development, Paris, 1971; R. G. D. Allen, *Index Numbers in Theory and Practice*, Aldine Publishing Co., Chicago, 1975; United Nations, *Guidelines on Principles of a System of Price and Quantity Statistics*, New York, 1977; Richard Stone, *Quantity and Price Indexes in National Accounts*, Organization for European Economic Cooperation, Paris, 1956; Franklin M. Fisher and Karl Shell, *The Economic Theory of Price Indices*, Academic Press, New York, 1972; and Dan Usher, *The Measurement of Economic Growth*, ch. 4, Columbia University Press, New York, 1980.

[51] Bergson, 1961, pp. 25-41, discusses the various economic interpretations of the two indexes. Also, see Becker, 1969, pp. 69-72, and the sources listed in footnote 50.

[52] The benchmark of the US accounts in 1981 retained 1972 as the base year, implying that the data for using a more recent base year are not available or that the US national income accountants do not think the change in relative prices is a severe problem. Many OECD countries, however, have shifted to a 1975 base year.

If this expression is deflated by a Paasche (current-year weighted) price index, then the desired Laspeyres output index is obtained:

$$\frac{\dfrac{\sum_{i=1}^{N} Q(t,i)p(t,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)}}{\dfrac{\sum_{i=1}^{N} Q(t,i)p(t,i)}{\sum_{i=1}^{N} Q(t,i)p(0,i)}} = \frac{\sum_{i=1}^{N} Q(t,i)p(0,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)}$$

Rarely is information available on production and prices for all goods and services in both the base and the given year. If only a sample of observations is available, then the two sides of the previous equation may not be the same. For example, suppose there are N products, but price and quantity data are available only for n (less than N) products. The estimated growth of output from year 0 to year t using the deflated current-price index would be:

$$\frac{\sum_{i=1}^{N} Q(t,i)p(0,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)} = \frac{\sum_{i=1}^{N} Q(t,i)p(t,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)} \times \frac{\sum_{i=1}^{n} Q(t,i)p(0,i)}{\sum_{i=1}^{n} Q(t,i)p(t,i)}$$

and the estimate using the quantity index would be:

$$\frac{\sum_{i=1}^{N} Q(t,i)p(0,i)}{\sum_{i=1}^{N} Q(0,i)p(0,i)} = \frac{\sum_{i=1}^{n} Q(t,i)p(0,i)}{\sum_{i=1}^{n} Q(0,i)p(0,i)}$$

If n = N, then the two equations are identical. If n is less than N, the reliability of the deflated current-price index depends on the accuracy of the price index computed from the sample data, and the reliability of the quantity index depends on the representativeness of the quantity sample. Hill argues that the price index is likely to be more accurate, especially when large numbers of new products are being introduced and old products withdrawn.[33] Unfortunately, Soviet price data are so scarce and unreliable that the deflation method is not practical either for GNP as a whole or for most individual sector indexes. The quantity index method is relied upon almost exclusively.

Specific Index Number Problems

Several specific index number problems are also important in the measurement of Soviet GNP. They arise in the treatment of regional production, seasonal production, price discrimination, quality changes, and unique products.

Regional Production. The resources required to produce a given product may be quite different depending on where a product is made. For example, a school building of exactly the same dimensions may cost much more to construct in Siberia than in the Ukraine because of greater transportation expenses, more stringent structural requirements, a larger heating unit, and more difficult construction conditions. To the extent that the added cost reflects real differences in the use of resources, a shift in production to a more expensive region represents an increase in production rather than a price increase. Theoretically, we should construct weighted regional production indexes, but the scarcity of data does not permit doing so. The influence of regional production on the growth of GNP is probably most important in the construction, agriculture, and fuel sectors.

Seasonal Production. Changes in seasonal production patterns present a similar problem. A vegetable grown near Moscow in a hothouse during the winter requires more resources than the same vegetable grown outdoors during the summer. Theoretically, the two vegetables should be treated as different products, and a production or price index containing them should be weighted appropriately. The Soviet Union attempts to capture this effect in the construction sector by allowing price supplements for work done during the winter. No adjustments are made in this study.

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[33] Hill, *Measurement*, p. 25.

Price Discrimination, Quality Changes, and Unique Products. According to one of the conditions of the AFCS, product prices must be uniform within a market area. This condition is violated frequently in the Soviet Union, especially in energy pricing. Some sectors pay preferential prices, receive higher quality products for the same price, or enjoy special delivery privileges. To the extent that differential prices are included in the input-output data, the factor-cost prices are inaccurate. Changes in the degree of discrimination will also affect the indexes.

The problem of quality change is pervasive in index computations. The basic question is how much of the change in the price of a product actually reflects a change in the quantity of the services provided by the product. The answer is not always clear. The problem is particularly severe in the Soviet case, because we rarely can observe products over time on a scale sufficient to assess quality changes and because a common method of raising prices in the Soviet Union is to make a cosmetic change in the product and call it a new product. The quality problem mainly affects our index of industrial production, which frequently relies on physical output data covering fairly broad product categories. The lack of adjustments for quality changes probably understates real quantity changes.[14]

Many investment goods are produced as unique products or in very small batches. Most construction projects and as much as one-third of producer durables constitute unique products. A variety of techniques have been devised to measure the real cost of unique products: summing input costs; using hedonic indexes; using a related, standard product as an analog; and computing the cost as a sum of standard components. The construction index used here, for example, is a material-input index rather than an output index. Although we suspect that our index of investment in producer durables (based on official values in so-called constant estimate prices) overstates growth, we lack the data to use an alternative approach.

Problems of Measuring the Real Growth of Value Added

The discussion to this point has centered on the problems of any constant-price activity index. The construction of indexes of value added in economic sectors poses additional problems. Value added cannot be measured directly in constant prices because changes in depreciation, profits, and social insurance do not lend themselves to separation into price and quantity changes. Therefore, value added is computed as a residual—the difference between gross output and current material inputs. This procedure makes value added especially subject to measurement error.

Specialists generally agree that the preferred approach to measure real changes in value added is the so-called double deflation method. If Q(j,t) is the gross output of sector j in year t, q(i,j,t) is the current input of type i used by sector j in year t, n is the number of sectors, and p(j,t) is the price of the good or service produced by sector j in year t, then value added in sector j in year t is:

$$p(j,t)Q(j,t) - \sum_{i=1}^{n} p(i,t)q(i,j,t).$$

The value added in base-year prices (year 0) is then computed as the difference between the deflated values of both terms, or:

$$V(j,t) = p(j,0)Q(j,t) - \sum_{i=1}^{n} p(i,0)q(i,j,t).$$

The virtue of this approach is that it preserves consistency between the end-use and sector-of-origin accounts. If the sales of all sectors are properly deflated, then the sum of deliveries to end-use components of GNP in base-year prices will equal the sum of deflated value added by sectors of origin.

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[14] See *Comparing Planned and Actual Growth*, Central Intelligence Agency, Washington, D.C., for a discussion of this problem.

Several problems preclude widespread use of double deflation:

- It requires a great deal of data to implement. A full I-O table is needed for a complete accounting of a sector's inputs. A surrogate method relying on a price index of a sample of a sector's inputs can be used, but even this requires much data and will not support timely estimates.

- Double deflation assumes that the inputs actually used in year t by sector j would have been used even with a different set of relative prices, an unlikely occurrence. It is possible that value added calculated by the double deflation method could be negative if the prices of some of the major inputs in year t increased greatly between year 0 and year t.

- Because double deflation is the difference between two values, it is subject to large fluctuations that result from small fluctuations in the two other values.[55]

It turns out that double deflation is optimal only when knowledge of both the output and input indexes is perfect. As uncertainty about either index increases, the advantages of using the gross output index increase.[56] Hill surveyed the practice of OECD members and found that agriculture is the only sector for which double deflation is frequently used. This practice is also true of our sector-of-origin indexes. Except for agriculture, we use gross output or some other indicator of the level of production as our index of value added.

If double deflation is not used, and if a gross output index is not available or not accurate enough, then some other indicator must be used. Among those that have been suggested are an input index; an employment, hours worked, or deflated wages index; an employment index plus an arbitrary productivity allowance; or an index of some related industry. In this study we have used gross physical output in most of the nonservice sectors. We also use gross output indexes for some of the service sectors, but many are simple indexes of man-hour employment. A detailed list of our sectors and the type of index used for each follows. The construction of the indexes is described in appendixes B and C.

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[55] Hill investigated the conditions under which double deflation is the best procedure for estimating value added (*Measurement*, ch. 2.) Let y be the ratio in constant prices of the inputs used by sector j in year t compared to year 0:

$$y = \Sigma p(i,0)q(i,j,t)/\Sigma p(i,0)q(i,j,0).$$

Let z be the gross output index of sector j:

$$z = p(j,0)Q(j,t)/p(j,0)Q(j,0).$$

Finally, let x equal the ratio of sector j's inputs to its gross output:

$$x = \Sigma p(i,0)q(i,j,0)/p(j,0)Q(j,0).$$

It can be shown that the index of value added in constant prices is the following weighted average of z and y:

$$v = (w)(z)+(1-w)(y), \text{ where}$$

$$w = 1/(1-x).$$

Since x is always less than 1, w is greater than 1 and $1-w$ is less than 0.
If sector j uses very few inputs, then x is small, w is close to 1, and the value-added index approximates a gross output index. If sector j's use of inputs is high, then w is very large, and the weight for the inputs, $1-w$, becomes a large negative value.
The question now becomes should v be computed as the weighted average thus described, as an index of gross output, or as an index of some other quantity, such as employment. The answer depends on the reliability of the various indexes involved. Unfortunately, if both z and y have some error, the error in v will tend to be the sum of the two errors rather than their average or difference. Therefore, the error in v increases rapidly with an increase in uncertainty in the two other indexes. This error should then be compared with the error that would be obtained by using the gross output index alone.

[56] Ibid, p. 20, and footnote 55. According to Hill, if $x = 0.5$ and if the standard deviations of the errors in the growth rates of the output and input indexes are both 1 percentage point, then the difference between the output and input indexes must be at least 2 percentage points in order for double deflation to be preferred to the use of the gross output index alone.
It is interesting that the gross output index is always closer to the value-added index than is the input index. The expression of v as a weighted average of z and y can be rewritten as:

$$\begin{aligned} v &= wz+(1-w)y \\ &= z+wz-z-(w-1)y \\ &= z+(w-1)(z-y). \end{aligned}$$

Therefore, if $z > y$ (gross output grows faster than inputs) and if $w-1 > 0$ (the base-year share of inputs is between 0 and 1), then:

$$\begin{aligned} v &= z+(w-1)(z-y) \\ &= z+b, \text{ where } b > 0, \text{ and } v > z > y. \end{aligned}$$

The reverse is also true: if $z < y$, then $v < z < y$. Therefore, if indexes of gross output and current inputs are both available, the gross output index is always a better indicator of value added unless the errors associated with the gross output index are much larger than those associated with the input index.

Soviet GNP Indexes

End-Use Indexes

Consumption. The consumption index (described in detail in JEC, *Consumption*) consists of three consumer goods indexes and eight consumer services indexes. The consumer goods indexes are (1) food, (2) soft goods, and (3) durables. The consumer services indexes are (1) housing, (2) utilities, (3) transportation, (4) communications, (5) repair and personal care, (6) recreation, (7) education, and (8) health.

Consumer Goods. **Food.** The food index aggregates 18 categories of food. Three basic types of indexes are used. Ten of the 18 (fish, meat, milk, vegetable oil, sugar, eggs, potatoes, vegetables, fruit, and flour and groats) are determined from physical per capita consumption data (published in the *Narkhoz*) and the size of the population. The milk, sugar, and flour and groats figures are known to contain the milk, sugar, and flour used in making butter, confectionery products, and macaroni products, so deductions are made in order to avoid double counting. Six of the 18 indexes are based on production data (butter, cheese, tea, margarine, confectionery products, and beverages), with adjustments for inventory changes and foreign trade where possible. The other two indexes (macaroni and tobacco) are based on deflated retail sales data. Deflated sales data are less satisfactory than the per capita consumption and production indexes because Soviet price indexes probably understate inflation and hence overstate growth. The 18 indexes are each multiplied by a 1970 estimate of consumption expenditures and then summed for each year to obtain consumption of food in 1970 established prices. For computation of the factor-cost prices, the food index was subdivided into four parts—animal products, processed foods, basic foods, and beverages, so as to take account of the differential effects of subsidies and taxes on different types of foods. Conversion to factor-cost prices raises the weight of animal products and lowers the weight of beverages.

Soft Goods. The soft goods index is a weighted sum of indexes for 15 line items. Nine line-item indexes (cotton, wool, silk, and linen fabrics; haberdashery; school supplies; publications, household soap; and toilet soap) are based on deflated retail sales. Five line-item indexes (hosiery; leather, rubber, and felt footwear; and knitwear) are based on physical production data, and one (sewn goods) is based on Soviet reported production in rubles in constant prices. As with the food index, each line-item index is multiplied by estimated consumption expenditures in 1970 and summed. No attempt is made to recompute the internal weights of the soft goods index in factor-cost prices.

Durables. The consumer durables index is the least satisfactory of the consumption indexes. It consists simply of total deflated retail sales of nonfood goods less the deflated retail sales of identified nondurable goods. All retail sales are deflated, if possible, by the corresponding official retail sales price index. The resulting series undoubtedly includes some nondurables and is not adequately deflated. There is not enough information, however, to construct an index based on production or sales of individual consumer durables.

Consumer Services. **Housing.** The housing index is the stock of housing measured in millions of square meters of urban and rural housing—the only aggregate data available. Since the index is based on purely physical measures, it does not capture changes in the average quality of Soviet housing.[57]

Utilities. The utilities index is a weighted average of household consumption of electricity, gas, and the urban housing stock. The latter is intended to represent household consumption of centralized heat, hot water, water, and sewage services, for which data are not available. Information for electricity and gas consumption is incomplete and involves some interpolations and extrapolations.

Transportation. This index is a weighted average of nine modes of passenger transportation. Rail, sea, inland-waterway, bus, and air transport are measured by passenger-kilometers; tram, trolleybus, and subway transport are measured by the number of rides; and taxi services are measured by the volume of paid kilometers. It was assumed that 25 percent of the 1970 expenditures on passenger transportation represented business travel expenditures; this amount was deducted in arbitrary proportions from the rail, air, and taxi weights. No allowance was made for a change in the relative importance of business travel over time.

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[57] See JEC, *Consumption*, for a more detailed discussion of this problem.

Communications. Since a large share (about two-thirds) of communications activity is considered to be consumption rather than production related, we use our index for total communications as a sector of origin. This index is a weighted average of: (1) the volume of letters, newspapers, parcels, and money orders mailed, (2) the number of telegrams sent, (3) the stock of telephones and the volume of long distance telephone calls, and (4) the stock of radio and television receivers and the number of radio relay facilities.

Repair and Personal Care. This index is the sum of expenditures on state-supplied services and on private services. State services include the repair of clothing, shoes, furniture, radio and television receivers; dry cleaning; film processing; and similar household services. The index is based on sales data in constant prices patched together from several *Narkhoz* series. Estimates of sales to state organizations were deducted from the *Narkhoz* values. Also the value of materials used in some types of services, but not included in the *Narkhoz* data, were added. The purchase of private services is based on a few reports of aggregate expenditures and is not a satisfactory index. It represents, however, a declining share of the total index; hence, errors in the estimate of private services should not greatly disturb the total index.

Recreation. The recreation index attempts to measure a diverse collection of expenditures. It is computed as a weighted average of the number of movie and theater admissions, the number of people attending resorts, and employment in hotels. The latter is a crude measure of personal expenditures on hotels.

Education. The education index is a weighted average of indexes of employment and other current expenditures. The employment index is based on man-hour data and is straightforward. The calculation of other current expenditures is quite complicated. It is based on budgetary data for several levels of educational activities. For each level, all labor and capital expenditures identified in republic budget data are subtracted from the total, yielding a residual that is assumed to represent current expenditures other than labor costs. Each index of nonlabor current expenditures is then applied to a USSR total for that level of educational activity to obtain a series of nonlabor current expenditures expressed in current prices. The sum of those series is then deflated by our implicit price index for the consumption of goods.[58]

Health. Construction of this index parallels that of the education index, but in less detail.

Investment. The index of Soviet investment is a weighted average of indexes of new fixed investment and capital repair. The index of new fixed investment, in turn, is a weighted average of investment in machinery and equipment, construction and other capital outlays, and net additions to livestock. The index of investment in machinery and equipment is taken directly from the *Narkhoz*, and is said to be in constant prices. Most machinery and equipment, however, are produced by the machinery sector, for which the published price index is widely believed to be seriously understated.[59] Thus, we suspect that the growth of investment in machinery and equipment may be overstated. The index of construction and other capital outlays are derived from our sector-of-origin construction index described below. The two major products of the construction sector are new construction and capital repair. The construction component of capital repair is estimated and then subtracted from the sector-of-origin index for the total construction sector. The *Narkhoz* series on

[58] See M. Elizabeth Denton, "Soviet Consumer Policy: Trends and Prospects," JEC, *1979*, p. 766, for the derivation of this price index.

[59] *An Analysis of the Behavior of Soviet Machinery Prices, 1960-73*, US Central Intelligence Agency, Washington, D.C., 1979; and Abraham Becker, "The Price Level of Soviet Machinery in the 1960s," *Soviet Studies* 26, July 1974, pp. 363-379, are two of many sources that discuss the shortcomings of the official machinery price index.

investment in construction-installation work is believed to overstate the growth of new construction. While the residual calculation used here is not fully satisfactory, the resulting index does show slightly slower growth than the *Narkhoz* series. The series on net additions to livestock is a part of the index of agricultural output and is based on reported changes in livestock numbers. The major difficulty with this index is that large changes in livestock inventories often reflect disproportionate swings in the numbers of young livestock, whose value per head is less than average. This causes excessive fluctuations in the index. The capital repair index is a deflated current-price index. The major data available on capital repair are current-price data on amortization deductions and budget allocations for capital repair. The machinery and construction components are deflated separately using price indexes constructed by comparing Soviet production in current prices with our reconstructions in constant prices.

Other Government Expenditures. *Government Administrative Services.* This index is a collection of small services: (1) general agricultural programs, (2) forestry, (3) state administration and administrative organs of social organizations, (4) culture, (5) municipal services, and (6) civilian police. All of these indexes are based on man-hour employment because we have no physical indicators to measure the output of these services. As is well known, indexes based on employment, by definition, do not reflect changes in labor productivity.

Research and Development. This index attempts to measure what the Soviet Union defines as science expenditures. Unfortunately, Soviet data and definitions are not always clear and often conflict with other published data. The problem is greatly compounded by the belief that Soviet science is heavily oriented toward military objectives and by the fact that many different sources of finance exist. Thus, this index is subject to considerable error in its interpretation and growth rate. It is constructed as a weighted average of man-hour employment and other current expenditures. The employment component is based on *Narkhoz* employment data for science and estimated average annual hours of work. The other current expenditures component is based on data for 1960-72 from a Soviet monograph and the observation that other current expenditures were a nearly constant share of total expenditures in that period. The resulting current-price expenditure data are deflated by a price index made up mostly from Soviet wholesale price indexes and weighted by the structure of material expenditures in science.

Outlays n.e.c. This final end-use component is the residual of total GNP, calculated from the sector-of-origin indexes, less the identified end-use components described above. This component includes a large portion of defense expenditures, net exports, inventory change, other unidentified outlays, and a statistical discrepancy.

Sector-of-Origin Indexes

Industry. The index of industrial production is a weighted average of 10 industrial branch indexes: (1) ferrous metals; (2) nonferrous metals; (3) fuel; (4) electric power; (5) machinery; (6) chemicals; (7) wood, pulp, and paper; (8) construction materials; (9) light industry; and (10) food industry. Each branch index is the sum of several subbranch indexes combined by value-added weights derived from the 1972 I-O table in producers' prices. Each subbranch index measures the gross output of an I-O sector by summing the physical production of several products, each multiplied by a base-year price. We do not have an index for the 11th branch, "other branches of industry." We assume the index for this branch to be the same as that of total industrial production. The index of industrial production is explained in detail by Ray Converse in JEC, *Industry*.

Construction. It would be desirable to measure construction activity by its gross output, but the only data available are a current-price gross output series and a constant-price series for the construction-installation component of investment (Soviet definition). The latter excludes a significant part of the output of the construction sector (capital repair) and probably is not adequately deflated. For these reasons, we have constructed an independent index. It is a weighted average of material inputs. The structure of inputs is taken from the 1972 Soviet I-O table, and the growth of the individual inputs is taken from the corresponding parts of the industrial production and other indexes. The material-input index is less desirable than a double deflation or gross output index, but apparently the best that can be had with the data available.

Agriculture. The index of net agricultural production (gross production less intra-agricultural use) is described in detail by Margaret Hughes and Barbara Severin in JEC, *Agriculture*. It is derived as the sum of the physical production of 42 products multiplied by their average 1970 price, less the estimated quantities of seed and feed used by agriculture itself. The value-added index is then derived by subtracting an index of material purchases from nonagricultural sectors. The weights for this index are based on the 1972 I-O table.

Transportation. This index is a weighted average of indexes of freight and passenger transportation. Derivation of the passenger transportation index is the same as the end-use transportation index, but without any deductions for business travel in the 1970 weights. The freight transportation index is a weighted average of rail, sea, inland-waterway, oil-pipeline, truck, air, and gas-pipeline freight transportation. The output of all of the components is measured in ton-kilometers, except that of gas pipelines which is measured in cubic meters of gas shipped. The weights are 1970 revenues per ton-kilometer or per cubic meter.

Communications. The communications index is the same as the one described above as a part of consumption.

Trade. The trade index is a weighted average of the three main activities of the domestic trade sector: (1) retail trade, (2) wholesale trade and material-technical supply, and (3) agricultural procurement. The retail trade index is an average of the consumption indexes for food (less income in kind), soft goods, and durables. The wholesale trade index is a gross output weighted average of the indexes of all of the branches of industry except the electric power and other industry branches. The agricultural procurement index is a weighted average of state purchases of 16 types of agricultural products. The weights are 1970 procurement prices. The three component indexes are combined with estimated 1970 value-added weights.

Services. The service indexes on the sector-of-origin side of the accounts are the same as those described in the list of end-use indexes except that an index is added for the credit and insurance sector. Only this index and any differences from the end-use indexes are described here.

The credit and insurance index represents employment converted to hours worked. All of the reservations about employment indexes apply to this index. Indeed, the credit and insurance index almost certainly fails to capture labor productivity growth that results from effective application of machine calculators and computers. We have no evidence, however, on which we could estimate a productivity allowance.

The sector-of-origin utilities index measures the value added by that part of the housing-communal economy sector that supplies water, gas, heat, and sewage services. The delivery of gas is measured by total gas production and the delivery of all other services is measured by the stock of urban housing.

The education and health indexes for sector of origin use only the labor component of the end-use indexes.

Military Personnel. This is an index of personnel costs in 1970 prices as estimated by the CIA.

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Appendix A

Soviet Gross National Product, 1950-80

This appendix presents the main statistical results of this report. All data included here utilize the 1970 factor-cost weights. A similar set of data could be calculated using the 1970 established-price weights. The indexes for each sector (except military personnel) and their growth rates are the same in both types of prices. The ruble values, percentage shares of GNP, and the aggregate indexes are different in factor-cost prices than in established prices.

Tables A-1 through A-5 contain data on Soviet GNP by sector of origin. Table A-1 shows the value added in each sector as measured in 1970 factor-cost rubles. These data are obtained by multiplying the base-year (1970) ruble values for each sector by its corresponding index. Total GNP and the subtotals for industry, services, and government administrative services are obtained by addition. Tables A-2 and A-3 show average annual growth rates for five-year periods and annual growth rates for each component. All of the growth rates are derived from the ruble data in table A-1. The percentage distribution of GNP by sector of origin is shown in table A-4. The percentage values are derived by dividing the ruble value for each component by the ruble value for total GNP. The sectoral indexes used to compute the ruble data are shown in table A-5. The indexes for total GNP and the subtotals are derived from the ruble data in table A-1.

Data on Soviet GNP by end use are shown in tables A-6 through A-12. The ruble values, average annual growth rates for five-year periods, and annual growth rates are shown in tables A-6 through A-8 and are derived in the same manner as the sector-of-origin data. The data for total GNP are taken directly from the sector-of-origin tables and the ruble values for outlays n.e.c. are obtained as the residual of total GNP less the sum of the other end-use components. The percentage distribution of GNP by end use and the sectoral indexes are shown in tables A-11 and A-12. Tables A-9 and A-10 contain data on per capita consumption, per capita GNP, and the population size. Table A-9 presents these data in rubles (the population data are in millions of people) and table A-10 has average annual growth rates for five-year periods.

Table A-1

Billion 1970 Rubles

GNP by Sector of Origin

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Industry	27.2	30.5	33.1	36.1	39.8	44.1	47.8	51.5	56.1	61.3
Ferrous metals	2.0	2.2	2.6	2.8	3.1	3.4	3.6	3.8	4.1	4.5
Nonferrous metals	0.9	1.0	1.2	1.3	1.4	1.7	1.8	1.9	2.0	2.1
Fuel	2.9	3.2	3.4	3.6	4.0	4.5	5.0	5.6	6.1	6.6
Electric power	1.0	1.2	1.3	1.5	1.7	1.9	2.2	2.4	2.7	3.0
Machinery	8.3	9.1	9.9	10.8	11.8	13.2	14.1	15.1	16.2	17.7
Chemicals	1.0	1.1	1.2	1.3	1.5	1.7	2.0	2.1	2.4	2.6
Wood, pulp, and paper	3.8	4.3	4.5	4.7	5.1	5.4	5.6	6.0	6.6	7.2
Construction materials	1.1	1.3	1.5	1.7	2.0	2.3	2.6	3.0	3.6	4.2
Light industry	2.7	3.2	3.4	3.7	4.2	4.4	4.7	4.9	5.3	5.7
Food industry	2.6	3.0	3.2	3.6	3.9	4.2	4.8	5.1	5.5	6.0
Other industry	0.8	0.9	1.0	1.0	1.2	1.3	1.4	1.5	1.6	1.8
Construction	5.7	6.5	7.2	7.9	8.8	10.0	10.9	12.1	13.7	15.3
Agriculture	40.8	37.6	39.5	41.9	42.7	48.4	55.5	54.7	59.3	60.5
Transportation	5.2	5.8	6.4	7.0	7.8	9.2	10.2	11.7	12.9	14.3
Communications	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.3	1.3	1.4
Trade	6.7	7.3	8.0	8.9	9.8	10.7	11.7	12.6	13.9	14.8
Services	39.4	40.3	41.3	41.9	42.6	43.3	44.2	45.3	47.4	49.4
Housing	13.3	13.7	14.1	14.4	14.9	15.3	15.9	16.6	17.5	18.5
Utilities	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.9	0.9	1.0
Repair and personal care	2.2	2.2	2.2	2.3	2.3	2.4	2.3	2.3	2.4	2.8
Recreation	1.3	1.4	1.4	1.5	1.6	1.9	1.9	2.0	2.1	2.2
Education	6.9	7.1	7.3	7.5	7.9	8.2	8.3	8.5	8.7	8.9
Health	3.4	3.5	3.6	3.8	4.0	4.3	4.4	4.6	4.8	5.1
Science	1.4	1.6	1.7	1.8	1.9	2.0	2.3	2.6	2.9	3.2
Credit and insurance	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Government administrative services	9.3	9.3	9.3	8.9	8.3	7.4	7.2	6.9	7.0	6.8
General agricultural programs	0.7	0.8	0.8	0.8	0.8	0.6	0.6	0.6	0.7	0.8
Forestry	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5
State administration and the administrative organs of social organizations	5.2	5.2	5.1	4.9	4.4	3.9	3.7	3.5	3.5	3.3
Culture	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7
Municipal services	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Civilian police	1.7	1.6	1.6	1.6	1.4	1.2	1.2	1.1	1.1	1.1
Military personnel	7.5	8.4	9.0	8.3	7.7	7.2	7.1	6.6	6.1	5.7
Other branches	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.6
Gross national product	133.6	137.7	145.8	153.4	160.7	174.5	189.1	196.2	211.2	223.4

Table A-1 (Continued) Billion 1970 Rubles

GNP by Sector of Origin

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Industry	65.7	70.1	75.3	79.8	85.0	90.4	95.5	102.1	108.8	114.6
Ferrous metals	4.8	5.3	5.7	6.0	6.5	6.9	7.3	7.7	8.1	8.3
Nonferrous metals	2.3	2.5	2.7	3.0	3.1	3.4	3.7	4.0	4.3	4.6
Fuel	7.0	7.3	7.7	8.4	8.9	9.5	10.1	10.6	11.0	11.4
Electric power	3.3	3.7	4.2	4.6	5.2	5.7	6.1	6.6	7.2	7.7
Machinery	19.3	20.9	23.1	24.5	26.1	27.5	28.8	30.7	33.5	35.8
Chemicals	2.9	3.2	3.5	3.9	4.4	5.1	5.6	6.1	6.6	7.0
Wood, pulp, and paper	7.2	7.2	7.3	7.6	8.0	8.1	8.2	8.6	8.8	9.0
Construction materials	4.7	5.0	5.3	5.4	5.7	6.1	6.5	6.9	7.2	7.4
Light industry	6.1	6.3	6.5	6.6	6.8	6.9	7.4	8.0	8.7	9.2
Food industry	6.3	6.8	7.2	7.5	7.9	8.8	9.2	9.8	10.4	11.0
Other industry	1.9	2.0	2.2	2.3	2.5	2.6	2.8	3.0	3.2	3.3
Construction	16.5	17.4	18.2	18.9	19.9	21.1	22.1	23.8	25.0	26.0
Agriculture	59.3	63.4	61.5	48.7	64.4	68.1	70.8	69.7	74.0	70.8
Transportation	15.7	16.8	18.2	19.7	21.5	24.1	25.7	27.9	29.8	31.4
Communications	1.5	1.6	1.7	1.8	2.0	2.2	2.4	2.6	2.8	3.1
Trade	15.8	16.5	17.4	18.1	18.8	20.0	21.6	23.1	24.9	26.2
Services	51.4	53.3	55.8	58.0	60.9	63.8	66.7	69.6	72.7	75.6
Housing	19.6	20.5	21.4	22.3	23.1	23.8	24.6	25.4	26.2	26.9
Utilities	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.0	2.1
Repair and personal care	2.7	2.4	2.4	2.5	2.7	3.0	3.3	3.6	3.9	4.2
Recreation	2.3	2.4	2.4	2.4	2.6	2.7	2.7	2.9	3.0	3.1
Education	9.1	9.5	10.2	10.7	11.4	12.1	12.7	13.2	13.7	14.1
Health	5.3	5.5	5.7	5.9	6.1	6.4	6.6	6.8	7.1	7.4
Science	3.7	4.1	4.6	4.9	5.3	5.6	6.0	6.3	6.7	7.2
Credit and insurance	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.2	1.3
Government administrative services	6.7	6.6	6.8	6.8	7.1	7.5	7.9	8.4	8.9	9.4
General agricultural programs	0.9	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.2
Forestry	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
State administration and the administrative organs of social organizations	3.1	3.1	3.2	3.1	3.3	3.5	3.7	3.9	4.1	4.3
Culture	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.2	1.3
Municipal services	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7
Civilian police	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.4
Military personnel	5.6	5.5	5.7	5.9	6.1	6.3	6.4	6.6	6.9	7.2
Other branches	0.6	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0
Gross national product	232.3	245.3	254.5	251.7	279.4	296.8	311.9	326.3	346.0	355.9

Table A-1 (Continued)

Billion 1970 Rubles

GNP by Sector of Origin

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industry	122.6	130.0	136.6	144.5	153.9	163.4	169.8	176.5	182.6	188.0	193.4
Ferrous metals	8.8	9.1	9.4	9.8	10.2	10.7	11.0	11.0	11.3	11.3	11.3
Nonferrous metals	4.8	5.1	5.4	5.8	6.1	6.4	6.6	6.8	7.0	7.2	7.3
Fuel	12.1	12.7	13.3	13.9	14.6	15.4	16.0	16.7	17.2	17.7	18.1
Electric power	8.3	9.0	9.6	10.3	11.0	11.7	12.5	12.9	13.5	13.9	14.6
Machinery	38.5	41.7	44.5	48.3	52.4	56.4	59.5	62.9	66.4	70.1	73.2
Chemicals	7.8	8.4	8.9	9.7	10.7	11.7	12.3	12.9	13.4	13.4	14.1
Wood, pulp, and paper	9.4	9.7	9.8	10.1	10.3	10.7	10.7	10.7	10.7	10.3	10.6
Construction materials	8.0	8.5	9.0	9.5	10.0	10.4	10.8	11.0	11.2	11.3	11.4
Light industry	9.8	10.2	10.3	10.6	10.8	11.2	11.6	11.9	12.2	12.4	12.7
Food industry	11.6	11.9	12.3	12.4	13.4	14.1	13.9	14.5	14.3	14.8	14.6
Other industry	3.6	3.8	4.0	4.2	4.5	4.7	4.9	5.1	5.3	5.5	5.6
Construction	28.0	29.9	31.5	33.3	35.0	36.8	38.0	38.9	40.1	40.4	41.4
Agriculture	81.0	79.6	72.8	84.9	83.0	72.0	80.2	83.0	85.9	78.8	73.1
Transportation	33.4	35.7	37.6	40.3	43.2	45.8	47.8	48.8	51.1	52.3	54.3
Communications	3.3	3.6	3.8	4.1	4.4	4.7	5.0	5.3	5.6	5.9	6.2
Trade	28.0	29.4	30.3	31.9	33.5	35.1	36.3	37.6	38.9	39.8	40.7
Services	78.5	81.4	84.3	87.1	90.0	92.8	95.1	97.4	100.4	103.4	106.6
Housing	27.7	28.5	29.2	30.0	30.8	31.6	32.3	33.1	33.9	34.6	35.3
Utilities	2.2	2.3	2.4	2.5	2.6	2.8	3.0	3.1	3.2	3.4	3.6
Repair and personal care	4.6	4.8	5.2	5.5	5.9	6.2	6.6	6.9	7.4	7.9	8.4
Recreation	3.1	3.2	3.2	3.3	3.4	3.4	3.4	3.4	3.5	3.6	3.7
Education	14.5	15.0	15.3	15.6	15.9	16.3	16.6	16.9	17.3	17.7	18.3
Health	7.6	7.9	8.1	8.3	8.5	8.6	8.8	8.9	9.0	9.3	9.3
Science	7.8	8.3	8.9	9.5	9.9	10.4	10.6	10.9	11.2	11.7	12.2
Credit and insurance	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3
Government administrative services	9.6	10.0	10.4	10.7	11.2	11.6	11.9	12.3	12.7	13.0	13.4
General agricultural programs	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.8
Forestry	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
State administration and the administrative organs of social organizations	4.4	4.6	4.7	4.9	5.1	5.3	5.4	5.5	5.6	5.8	5.9
Culture	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.1
Municipal services	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1
Civilian police	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.8	1.9
Military personnel	7.4	7.6	7.7	7.8	7.9	8.0	8.1	8.1	8.2	8.2	8.3
Other branches	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.4
Gross national product	383.3	398.2	405.7	435.2	452.2	459.7	481.6	497.0	514.1	518.2	525.4

Table A-2

Percent

Average Annual Rates of Growth of GNP by Sector of Origin

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Industry	10.2	8.3	6.6	6.3	5.9	3.4
Ferrous metals	11.1	7.6	7.2	5.1	4.0	1.1
Nonferrous metals	12.8	6.9	7.6	7.4	5.9	2.6
Fuel	9.4	8.9	6.3	5.0	5.0	3.3
Electric power	13.1	11.4	11.5	7.9	7.0	4.5
Machinery	9.6	7.9	7.4	6.9	7.9	5.3
Chemicals	11.6	10.5	12.0	8.9	8.6	3.8
Wood, pulp, and paper	7.4	5.8	2.6	2.9	2.6	−0.1
Construction materials	15.7	14.7	5.4	5.7	5.4	1.8
Light industry	10.4	6.4	2.6	7.2	2.7	2.6
Food industry	10.2	8.4	6.8	5.9	3.9	0.7
Other industry	10.2	8.3	6.6	6.3	5.9	3.4
Construction	11.8	10.5	5.0	5.8	5.6	2.4
Agriculture	3.5	4.2	2.8	3.5	−2.3	0.3
Transportation	12.3	11.3	9.0	6.7	6.5	3.5
Communications	8.1	7.0	7.1	8.9	7.3	5.8
Trade	9.9	8.2	4.8	7.0	4.6	3.0
Services	1.9	3.5	4.4	4.2	3.4	2.8
Housing	2.9	5.0	4.0	3.1	2.7	2.2
Utilities	5.4	9.1	8.1	5.5	5.1	5.0
Repair and personal care	1.8	2.2	2.3	8.9	6.5	6.2
Recreation	7.5	4.0	3.5	2.8	1.9	1.4
Education	3.6	2.2	5.9	3.7	2.2	2.5
Health	5.0	4.4	3.8	3.6	2.6	1.6
Science	7.5	12.5	9.0	6.7	6.0	3.2
Credit and insurance	−0.1	−2.4	1.5	5.5	5.9	4.6
Government administrative services	−4.5	−1.8	2.2	5.2	3.8	3.0
General agricultural programs	−4.5	9.7	−1.3	4.8	4.8	5.4
Forestry	−2.8	−4.0	1.3	1.7	0.9	0.3
State administration and the administrative organs of social organizations	−6.0	−4.1	2.2	4.9	3.5	2.5
Culture	3.5	1.6	5.5	8.4	5.0	3.6
Municipal services	2.7	1.4	3.4	5.3	4.5	3.3
Civilian police	−6.0	−4.1	2.2	4.9	3.5	2.5
Military personnel	−0.8	−4.8	2.2	3.4	1.6	0.6
Other branches	5.5	5.9	5.0	5.2	3.7	2.7
Gross national product	5.5	5.9	5.0	5.2	3.7	2.7

Table A-3

Percent

Annual Growth Rates of GNP by Sector of Origin

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Industry	12.2	8.5	9.1	10.1	11.0	8.2	7.7	9.0	9.3	7.2
Ferrous metals	13.0	13.7	9.7	9.0	10.1	7.6	5.9	6.8	8.7	8.8
Nonferrous metals	13.3	12.5	11.5	9.4	17.4	6.0	5.6	5.6	8.1	9.0
Fuel	9.2	6.9	6.9	10.3	13.8	11.0	11.5	9.2	7.0	6.0
Electric power	13.8	14.4	12.8	11.8	12.7	12.7	9.5	12.3	12.4	10.2
Machinery	9.8	8.6	8.9	9.0	11.8	7.2	6.8	7.5	9.0	9.1
Chemicals	9.8	9.1	10.3	13.8	14.9	12.2	9.5	12.2	8.7	10.1
Wood, pulp, and paper	13.4	3.9	4.3	10.1	5.5	3.6	7.0	9.3	9.2	0.1
Construction materials	13.7	12.8	16.7	16.5	18.8	11.0	16.2	19.3	15.1	12.1
Light industry	17.5	6.4	9.5	11.8	7.1	5.9	4.6	8.0	7.6	5.7
Food industry	14.7	9.0	11.0	7.2	9.3	12.9	6.6	7.5	10.4	4.7
Other industry	12.2	8.5	9.1	10.1	11.0	8.2	7.7	9.0	9.3	7.2
Construction	14.1	10.4	10.3	11.3	13.2	8.8	10.9	13.1	12.3	7.6
Agriculture	−8.0	5.1	6.0	2.0	13.3	14.7	−1.5	8.4	2.1	−2.0
Transportation	12.1	9.8	10.3	10.6	18.7	11.3	13.9	10.5	11.1	9.7
Communications	9.3	9.0	6.4	8.2	7.5	7.7	7.7	5.8	6.4	7.6
Trade	8.8	9.7	11.0	10.5	9.2	9.3	8.0	9.9	6.9	6.8
Services	2.4	2.4	1.4	1.7	1.5	2.2	2.3	4.7	4.3	4.0
Housing	2.6	2.7	2.7	2.9	3.2	3.5	4.3	5.3	5.9	5.8
Utilities	4.1	4.1	5.4	6.7	6.8	7.0	8.6	10.8	9.8	9.3
Repair and personal care	1.5	1.6	1.7	1.9	2.0	−2.2	−0.7	5.6	13.2	−3.8
Recreation	3.8	4.6	4.9	10.3	14.4	3.9	3.6	6.5	2.1	3.9
Education	3.4	3.3	2.5	4.6	4.1	1.4	1.9	2.5	2.2	2.8
Health	4.1	3.9	3.6	6.9	6.3	2.8	4.4	5.4	4.6	4.7
Science	9.9	8.2	5.0	5.8	9.0	13.2	10.8	13.3	10.9	14.4
Credit and insurance	−0.7	−0.7	0.2	0.2	0.2	−2.1	−4.2	−1.1	−2.7	−1.9
Government administrative services	0	0	−3.8	−7.3	−10.9	−1.9	−4.6	1.2	−2.6	−1.2
General agricultural programs	8.4	7.5	−8.5	3.7	−27.9	9.0	−4.1	18.7	5.5	21.5
Forestry	1.7	1.7	−10.1	−3.5	−3.4	−2.2	−5.6	−3.3	−6.7	−1.9
State administration and the administrative organs of social organizations	−1.5	−1.5	−3.5	−10.7	−12.0	−3.8	−5.8	−0.7	−4.3	−5.9
Culture	3.4	3.2	2.5	4.5	4.0	1.0	1.5	2.5	1.3	1.7
Municipal services	3.9	3.7	2.1	2.0	1.9	2.6	0.9	1.2	0.7	1.8
Civilian police	−1.5	−1.5	−3.5	−10.7	−12.0	−3.8	−5.8	−0.7	−4.3	−5.9
Military personnel	12.5	7.4	−8.0	−7.3	−6.8	−2.0	−5.9	−8.3	−6.9	−0.6
Other branches	3.1	5.9	5.2	4.7	8.6	8.4	3.8	7.6	5.8	4.0
Gross national product	3.1	5.9	5.2	4.7	8.6	8.4	3.8	7.6	5.8	4.0

Table A-3 (Continued)

Percent

Annual Growth Rates of GNP by Sector of Origin

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Industry	6.7	7.4	6.0	6.4	6.5	5.6	6.9	6.5	5.4	7.0
Ferrous metals	8.5	7.7	6.2	7.3	6.4	6.2	5.7	4.6	3.5	5.5
Nonferrous metals	8.4	8.9	7.8	6.0	7.2	9.7	8.9	8.0	5.0	5.6
Fuel	4.9	5.8	8.4	6.5	5.9	6.4	5.2	3.5	4.4	5.5
Electric power	12.1	12.8	11.2	11.2	10.0	7.6	7.7	8.8	7.9	7.6
Machinery	8.5	10.2	6.4	6.4	5.5	4.5	6.7	9.0	6.9	7.7
Chemicals	9.9	10.5	10.8	13.7	14.9	10.0	10.0	7.2	6.1	11.3
Wood, pulp, and paper	−0.1	2.4	4.2	4.5	2.0	0.5	5.0	2.4	1.8	4.9
Construction materials	7.4	5.1	2.8	4.8	6.9	7.2	7.1	3.9	2.0	8.5
Light industry	3.6	3.5	1.4	3.0	1.8	7.4	8.3	7.9	6.4	5.9
Food industry	7.3	6.2	4.2	5.3	11.2	4.5	7.4	5.6	5.7	6.0
Other industry	6.7	7.4	6.0	6.4	6.5	5.6	6.9	6.5	5.4	7.0
Construction	5.2	4.7	3.9	5.1	6.3	4.6	7.6	5.3	4.0	7.7
Agriculture	6.9	−3.0	−20.8	32.1	5.8	4.0	−1.6	6.3	−4.4	14.4
Transportation	7.2	8.0	8.3	9.3	12.0	6.4	8.7	6.9	5.1	6.6
Communications	5.9	6.2	5.9	7.1	10.4	10.5	10.3	7.2	8.7	7.5
Trade	3.9	5.8	4.1	3.9	6.1	7.9	7.4	7.4	5.4	7.0
Services	3.7	4.7	3.9	5.2	4.7	4.5	4.3	4.6	3.9	3.8
Housing	5.0	4.4	4.0	3.5	3.3	3.2	3.2	3.1	2.9	2.8
Utilities	9.2	8.4	8.0	7.7	7.2	6.1	5.7	5.2	5.0	5.4
Repair and personal care	−8.2	−1.5	2.3	8.8	11.1	10.3	9.8	9.3	6.4	8.8
Recreation	3.6	2.3	0.9	7.3	3.8	0.7	6.1	4.3	1.3	1.7
Education	4.5	6.9	5.5	6.7	5.9	4.8	3.6	4.2	3.1	3.0
Health	4.0	3.8	2.9	4.0	4.4	3.8	2.8	4.6	3.9	3.0
Science	11.8	11.1	7.9	8.8	5.4	6.6	4.2	6.9	6.9	8.7
Credit and insurance	0	2.2	1.9	2.9	0.6	4.9	5.4	5.4	5.1	6.7
Government administrative services	−1.1	2.0	0.4	4.2	5.5	5.5	7.0	5.7	5.1	2.7
General agricultural programs	−9.7	−1.4	−1.4	3.7	2.9	5.9	9.4	7.5	1.5	−0.1
Forestry	0.7	2.9	2.3	1.8	−1.3	2.2	1.0	2.4	1.4	1.4
State administration and the administrative organs of social organizations	−0.5	1.6	−0.8	4.0	7.0	5.9	6.6	4.9	5.4	1.9
Culture	3.2	6.4	5.4	6.8	5.6	4.8	10.0	10.1	8.8	8.3
Municipal services	1.1	3.3	3.9	5.1	3.7	4.8	7.7	4.9	4.9	3.9
Civilian police	−0.5	1.6	−0.8	4.0	7.0	5.9	6.6	4.9	5.4	1.9
Military personnel	−2.2	4.1	3.6	3.2	2.2	1.9	3.8	4.8	4.3	2.1
Other branches	5.6	3.8	−1.1	11.0	6.3	5.1	4.6	6.0	2.9	7.7
Gross national product	5.6	3.8	−1.1	11.0	6.3	5.1	4.6	6.0	2.9	7.7

Table A-3 (Continued) Percent

Annual Growth Rates of GNP by Sector of Origin

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industry	6.1	5.0	5.8	6.5	6.2	3.9	4.0	3.5	3.0	2.9
Ferrous metals	3.8	3.3	4.0	4.2	4.4	2.7	0.7	2.2	0.0	−0.3
Nonferrous metals	7.0	5.3	6.1	6.2	4.7	3.1	3.1	3.3	3.0	0.8
Fuel	4.8	4.7	4.9	4.9	5.9	3.7	4.2	3.1	3.0	2.3
Electric power	9.1	7.1	6.8	6.7	6.6	6.9	3.6	4.7	2.9	4.5
Machinery	8.1	6.9	8.3	8.5	7.7	5.5	5.6	5.6	5.6	4.3
Chemicals	8.1	6.7	9.0	9.5	9.7	4.8	5.2	3.6	0.2	5.2
Wood, pulp, and paper	2.8	2.0	2.7	1.8	3.6	−0.1	0.5	−0.5	−2.9	2.8
Construction materials	6.7	5.2	6.0	4.7	4.5	3.5	1.9	2.4	0.3	1.0
Light industry	4.5	0.7	2.8	2.7	2.9	4.2	2.5	2.6	1.8	2.0
Food industry	2.6	3.3	0.8	7.9	5.1	−1.1	4.0	−1.1	3.2	−1.4
Other industry	6.1	5.0	5.8	6.5	6.2	3.9	4.0	3.5	3.0	2.9
Construction	6.7	5.2	5.9	5.3	4.9	3.4	2.4	3.0	0.8	2.5
Agriculture	−1.7	−8.5	16.7	−2.2	−13.3	11.4	3.5	3.5	−8.3	−7.3
Transportation	6.7	5.5	7.2	7.0	6.1	4.4	2.2	4.6	2.3	3.9
Communications	7.3	7.4	7.2	7.2	7.2	6.4	5.7	5.5	5.6	5.6
Trade	4.8	3.3	5.3	5.0	4.5	3.6	3.6	3.4	2.4	2.4
Services	3.7	3.5	3.3	3.3	3.1	2.5	2.5	3.1	3.0	3.1
Housing	2.7	2.7	2.7	2.6	2.6	2.4	2.3	2.3	2.1	2.1
Utilities	5.0	4.2	4.8	5.7	5.8	5.7	4.8	4.8	5.2	4.4
Repair and personal care	6.2	6.7	6.9	6.5	5.9	5.8	4.8	7.0	6.8	6.7
Recreation	2.7	1.4	2.1	1.9	1.3	−1.2	0.8	2.9	1.9	2.6
Education	2.9	2.3	1.8	2.2	2.0	1.9	1.7	2.9	2.1	3.6
Health	3.4	2.7	2.2	2.5	1.9	1.9	1.3	1.2	2.7	0.9
Science	6.7	7.4	6.8	4.4	4.9	1.4	2.6	3.5	4.3	4.3
Credit and insurance	6.6	6.6	5.2	6.3	5.1	5.2	4.9	5.2	4.6	2.8
Government administrative services	4.2	3.8	3.4	4.2	3.5	3.1	2.8	3.3	2.7	3.0
General agricultural programs	6.8	4.5	4.0	4.1	4.6	9.1	2.3	6.2	3.9	5.6
Forestry	0.4	2.3	−0.5	1.4	0.7	−0.9	0.4	1.3	0.0	0.4
State administration and the administrative organs of social organizations	3.3	3.5	3.2	4.2	3.3	2.2	2.2	2.5	2.7	2.9
Culture	6.9	4.2	4.7	5.4	4.0	3.9	5.6	4.1	2.2	2.4
Municipal services	5.9	4.9	3.7	4.2	3.7	2.4	3.6	4.3	3.2	2.8
Civilian police	3.3	3.5	3.2	4.2	3.3	2.2	2.2	2.5	2.7	2.9
Military personnel	2.7	2.0	1.1	1.2	1.1	1.2	0.1	0.5	0.7	0.6
Other branches	3.9	1.9	7.3	3.9	1.7	4.8	3.2	3.4	0.8	1.4
Gross national product	3.9	1.9	7.3	3.9	1.7	4.8	3.2	3.4	0.8	1.4

Table A-4

Percent

Percentage Shares of GNP by Sector of Origin

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Industry	20.4	22.2	22.7	23.5	24.7	25.3	25.3	26.2	26.6	27.4
Ferrous metals	1.5	1.6	1.8	1.8	1.9	1.9	1.9	2.0	1.9	2.0
Nonferrous metals	0.7	0.8	0.8	0.8	0.9	1.0	0.9	1.0	0.9	1.0
Fuel	2.2	2.3	2.3	2.4	2.5	2.6	2.7	2.9	2.9	2.9
Electric power	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.2	1.3	1.3
Machinery	6.2	6.6	6.8	7.1	7.3	7.6	7.5	7.7	7.7	7.9
Chemicals	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2
Wood, pulp, and paper	2.8	3.1	3.1	3.0	3.2	3.1	3.0	3.1	3.1	3.2
Construction materials	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.7	1.9
Light industry	2.0	2.3	2.3	2.4	2.6	2.6	2.5	2.5	2.5	2.6
Food industry	1.9	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.6	2.7
Other industry	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Construction	4.3	4.7	4.9	5.2	5.5	5.7	5.8	6.2	6.5	6.9
Agriculture	30.6	27.3	27.1	27.3	26.6	27.7	29.4	27.9	28.1	27.1
Transportation	3.9	4.2	4.4	4.6	4.8	5.3	5.4	5.9	6.1	6.4
Communications	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Trade	5.0	5.3	5.5	5.8	6.1	6.1	6.2	6.4	6.6	6.6
Services	29.5	29.3	28.3	27.3	26.5	24.8	23.4	23.1	22.4	22.1
Housing	10.0	9.9	9.6	9.4	9.3	8.8	8.4	8.4	8.3	8.3
Utilities	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Repair and personal care	1.6	1.6	1.5	1.5	1.4	1.4	1.2	1.2	1.2	1.2
Recreation	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	1.0
Education	5.1	5.2	5.0	4.9	4.9	4.7	4.4	4.3	4.1	4.0
Health	2.5	2.5	2.5	2.4	2.5	2.4	2.3	2.3	2.3	2.3
Science	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.4	1.4
Credit and insurance	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4
Government administrative services	6.9	6.7	6.4	5.8	5.1	4.2	3.8	3.5	3.3	3.0
General agricultural programs	0.5	0.6	0.6	0.5	0.5	0.3	0.3	0.3	0.3	0.3
Forestry	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2
State administration and the administrative organs of social organizations	3.9	3.8	3.5	3.2	2.7	2.2	2.0	1.8	1.6	1.5
Culture	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Municipal services	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Civilian police	1.2	1.2	1.1	1.0	0.9	0.7	0.6	0.6	0.5	0.5
Military personnel	5.6	6.1	6.2	5.4	4.8	4.1	3.7	3.4	2.9	2.5
Other branches	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-4 (Continued) Percent

Percentage Shares of GNP by Sector of Origin

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Industry	28.3	28.6	29.6	31.7	30.4	30.5	30.6	31.3	31.4	32.2
Ferrous metals	2.1	2.1	2.2	2.4	2.3	2.3	2.3	2.4	2.3	2.3
Nonferrous metals	1.0	1.0	1.1	1.2	1.1	1.1	1.2	1.2	1.3	1.3
Fuel	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2
Electric power	1.4	1.5	1.6	1.8	1.8	1.9	2.0	2.0	2.1	2.2
Machinery	8.3	8.5	9.1	9.7	9.3	9.3	9.2	9.4	9.7	10.1
Chemicals	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.9	2.0
Wood, pulp, and paper	3.1	2.9	2.9	3.0	2.9	2.7	2.6	2.6	2.5	2.5
Construction materials	2.0	2.0	2.1	2.1	2.0	2.0	2.1	2.1	2.1	2.1
Light industry	2.6	2.6	2.6	2.6	2.4	2.3	2.4	2.5	2.5	2.6
Food industry	2.7	2.8	2.8	3.0	2.8	3.0	2.9	3.0	3.0	3.1
Other industry	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Construction	7.1	7.1	7.1	7.5	7.1	7.1	7.1	7.3	7.2	7.3
Agriculture	25.5	25.9	24.2	19.4	23.0	22.9	22.7	21.4	21.4	19.9
Transportation	6.8	6.9	7.1	7.8	7.7	8.1	8.2	8.6	8.6	8.8
Communications	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9
Trade	6.8	6.7	6.8	7.2	6.7	6.7	6.9	7.1	7.2	7.4
Services	22.1	21.7	21.9	23.0	21.8	21.5	21.4	21.3	21.0	21.2
Housing	8.4	8.4	8.4	8.9	8.3	8.0	7.9	7.8	7.6	7.6
Utilities	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Repair and personal care	1.1	1.0	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.2
Recreation	1.0	1.0	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9
Education	3.9	3.9	4.0	4.3	4.1	4.1	4.1	4.0	4.0	4.0
Health	2.3	2.2	2.2	2.3	2.2	2.1	2.1	2.1	2.1	2.1
Science	1.6	1.7	1.8	2.0	1.9	1.9	1.9	1.9	1.9	2.0
Credit and insurance	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Government administrative services	2.9	2.7	2.7	2.7	2.5	2.5	2.5	2.6	2.6	2.6
General agricultural programs	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Forestry	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
State administration and the administrative organs of social organizations	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Culture	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
Municipal services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Civilian police	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Military personnel	2.4	2.2	2.3	2.4	2.2	2.1	2.0	2.0	2.0	2.0
Other branches	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-4 (Continued)

Percent

Percentage Shares of GNP by Sector of Origin

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industry	32.0	32.7	33.7	33.2	34.0	35.5	35.2	35.5	35.5	36.3	36.8
Ferrous metals	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.1
Nonferrous metals	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Fuel	3.1	3.2	3.3	3.2	3.2	3.4	3.3	3.4	3.3	3.4	3.4
Electric power	2.2	2.3	2.4	2.4	2.4	2.5	2.6	2.6	2.6	2.7	2.8
Machinery	10.1	10.5	11.0	11.1	11.6	12.3	12.4	12.7	12.9	13.5	13.9
Chemicals	2.0	2.1	2.2	2.2	2.4	2.5	2.5	2.6	2.6	2.6	2.7
Wood, pulp, and paper	2.4	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.1	2.0	2.0
Construction materials	2.1	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.2	2.2
Light industry	2.5	2.6	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Food industry	3.0	3.0	3.0	2.9	3.0	3.1	2.9	2.9	2.8	2.9	2.8
Other industry	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1
Construction	7.3	7.5	7.8	7.6	7.7	8.0	7.9	7.8	7.8	7.8	7.9
Agriculture	21.1	20.0	17.9	19.5	18.4	15.7	16.7	16.7	16.7	15.2	13.9
Transportation	8.7	9.0	9.3	9.3	9.5	10.0	9.9	9.8	9.9	10.1	10.3
Communications	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.2
Trade	7.3	7.4	7.5	7.3	7.4	7.6	7.5	7.6	7.6	7.7	7.7
Services	20.5	20.4	20.8	20.0	19.9	20.2	19.7	19.6	19.5	20.0	20.3
Housing	7.2	7.1	7.2	6.9	6.8	6.9	6.7	6.7	6.6	6.7	6.7
Utilities	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Repair and personal care	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.6
Recreation	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Education	3.8	3.8	3.8	3.6	3.5	3.5	3.4	3.4	3.4	3.4	3.5
Health	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8
Science	2.0	2.1	2.2	2.2	2.2	2.3	2.2	2.2	2.2	2.3	2.3
Credit and insurance	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Government administrative services	2.5	2.5	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.6
General agricultural programs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Forestry	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
State administration and the administrative organs of social organizations	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Culture	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Municipal services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Civilian police	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4
Military personnel	1.9	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.6
Other branches	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-5

1970 = 100

Indexes of GNP by Sector of Origin

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Industry	22.2	24.9	27.0	29.5	32.4	36.0	38.9	42.0	45.7	50.0
Ferrous metals	22.6	25.6	29.1	31.9	34.8	38.3	41.2	43.7	46.6	50.7
Nonferrous metals	19.0	21.5	24.2	27.0	29.6	34.7	36.8	38.9	41.0	44.4
Fuel	24.0	26.3	28.1	30.0	33.1	37.6	41.8	46.6	50.9	54.5
Electric power	12.5	14.2	16.2	18.3	20.5	23.1	26.0	28.5	32.0	36.0
Machinery	21.6	23.7	25.8	28.1	30.6	34.2	36.7	39.2	42.1	45.9
Chemicals	13.0	14.3	15.6	17.2	19.6	22.5	25.3	27.7	31.0	33.7
Wood, pulp, and paper	40.4	45.8	47.6	49.6	54.7	57.6	59.7	63.9	69.9	76.3
Construction materials	14.2	16.1	18.2	21.2	24.7	29.4	32.6	37.9	45.2	52.0
Light industry	27.8	32.7	34.7	38.1	42.6	45.6	48.3	50.5	54.5	58.7
Food industry	22.3	25.5	27.9	30.9	33.1	36.2	40.9	43.5	46.8	51.7
Other industry	22.2	24.9	27.0	29.5	32.4	36.0	38.9	42.0	45.7	50.0
Construction	20.4	23.3	25.7	28.3	31.5	35.7	38.9	43.1	48.7	54.7
Agriculture	50.4	46.4	48.8	51.7	52.8	59.8	68.6	67.6	73.2	74.7
Transportation	15.5	17.3	19.0	21.0	23.2	27.6	30.7	34.9	38.6	42.9
Communications	22.4	24.5	26.7	28.4	30.8	33.1	35.6	38.4	40.6	43.2
Trade	23.9	26.0	28.5	31.6	34.9	38.2	41.7	45.1	49.5	52.9
Services	50.2	51.4	52.7	53.4	54.3	55.1	56.4	57.7	60.4	62.9
Housing	48.1	49.4	50.7	52.1	53.6	55.4	57.3	59.8	63.0	66.7
Utilities	25.9	26.9	28.0	29.6	31.5	33.7	36.0	39.1	43.4	47.6
Repair and personal care	47.8	48.6	49.3	50.2	51.1	52.2	51.0	50.7	53.5	60.6
Recreation	41.9	43.5	45.5	47.8	52.7	60.3	62.6	64.9	69.1	70.5
Education	47.2	48.8	50.4	51.7	54.0	56.2	57.0	58.1	59.5	60.8
Health	44.0	45.8	47.6	49.3	52.7	56.0	57.6	60.2	63.4	66.4
Science	18.2	20.0	21.6	22.7	24.0	26.2	29.6	32.8	37.2	41.3
Credit and insurance	80.8	80.3	79.8	79.9	80.1	80.3	78.6	75.3	74.5	72.4
Government administrative services	96.4	96.4	96.4	92.7	86.0	76.6	75.1	71.7	72.6	70.7
General agricultural programs	66.7	72.3	77.7	71.1	73.7	53.1	57.9	55.5	65.9	69.5
Forestry	121.8	123.9	126.0	113.3	109.3	105.6	103.2	97.4	94.2	87.9
State administration and the administrative organs of social organizations	118.3	116.6	114.8	110.7	98.9	87.0	83.7	78.8	78.2	74.9
Culture	39.9	41.2	42.5	43.6	45.5	47.3	47.8	48.5	49.7	50.4
Municipal services	53.4	55.4	57.5	58.7	59.8	60.9	62.5	63.1	63.9	64.3
Civilian police	118.3	116.6	114.8	110.7	98.9	87.0	83.7	78.8	78.2	74.9
Military personnel	101.4	114.0	122.5	112.7	104.4	97.3	95.4	89.8	82.3	76.5
Other branches	34.9	35.9	38.0	40.0	41.9	45.5	49.3	51.2	55.1	58.3
Gross national product	34.9	35.9	38.0	40.0	41.9	45.5	49.3	51.2	55.1	58.3

Table A-5 (Continued)

1970 = 100

Indexes of GNP by Sector of Origin

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Industry	53.6	57.2	61.4	65.1	69.3	73.8	77.9	83.3	88.7	93.5
Ferrous metals	55.1	59.8	64.4	68.4	73.4	78.1	82.9	87.6	91.6	94.8
Nonferrous metals	48.4	52.4	57.1	61.5	65.2	69.9	76.7	83.5	90.2	94.7
Fuel	57.7	60.6	64.1	69.4	73.9	78.3	83.3	87.7	90.8	94.8
Electric power	39.7	44.5	50.2	55.8	62.0	68.3	73.5	79.1	86.1	92.9
Machinery	50.1	54.3	59.8	63.7	67.7	71.5	74.7	79.7	86.9	92.9
Chemicals	37.1	40.8	45.1	50.0	56.8	65.3	71.8	79.0	84.7	89.8
Wood, pulp, and paper	76.4	76.3	78.1	81.4	85.1	86.8	87	91.5	93.7	95.4
Construction materials	58.3	62.6	65.8	67.6	70.9	75.8	81.2	87.0	90.4	92.2
Light industry	62.1	64.3	66.6	67.5	69.5	70.7	76.0	82.3	88.8	94.4
Food industry	54.1	58.1	61.7	64.3	67.7	75.3	78.6	84.4	89.2	94.3
Other industry	53.6	57.2	61.4	65.1	69.3	73.8	77.9	83.3	88.7	93.5
Construction	58.9	62.0	64.9	67.4	70.9	75.3	78.8	84.8	89.3	92.8
Agriculture	73.3	78.3	75.9	60.2	79.5	84.1	87.4	86.0	91.4	87.4
Transportation	47.0	50.4	54.4	59.0	64.4	72.2	76.9	83.6	89.3	93.8
Communications	46.5	49.2	52.3	55.3	59.3	65.4	72.3	79.8	85.5	93.0
Trade	56.5	58.7	62.2	64.7	67.2	71.3	76.9	82.6	88.7	93.5
Services	65.5	67.9	71.1	73.9	77.7	81.3	85.0	88.6	92.7	96.3
Housing	70.6	74.1	77.4	80.5	83.3	86.0	88.8	91.6	94.5	97.3
Utilities	52.0	56.8	61.5	66.4	71.5	76.6	81.3	85.9	90.4	94.9
Repair and personal care	58.3	53.5	52.7	54.0	58.7	65.3	72.0	79.0	86.4	91.9
Recreation	73.2	75.8	77.6	78.3	84.0	87.2	87.8	93.1	97.1	98.3
Education	62.5	65.3	69.9	73.7	78.7	83.3	87.3	90.4	94.2	97.1
Health	69.4	72.2	75.0	77.2	80.3	83.8	86.9	89.4	93.4	97.1
Science	47.2	52.7	58.6	63.2	68.7	72.4	77.3	80.5	86.0	92.0
Credit and insurance	71.0	71.0	72.6	74.0	76.1	76.6	80.3	84.6	89.2	93.8
Government administrative services	69.8	69.0	70.4	70.7	73.7	77.7	81.9	87.7	92.7	97.4
General agricultural programs	84.5	76.4	75.3	74.2	77.0	79.2	83.9	91.7	98.6	100.1
Forestry	86.2	86.9	89.4	91.5	93.1	91.9	94.0	94.9	97.2	98.6
State administration and the administrative organs of social organizations	70.5	70.1	71.2	70.7	73.5	78.6	83.3	88.8	93.1	98.1
Culture	51.3	52.9	56.3	59.3	63.4	66.9	70.1	77.1	84.9	92.4
Municipal services	65.4	66.2	68.3	71.0	74.6	77.4	81.1	87.4	91.7	96.2
Civilian police	70.5	70.1	71.2	70.7	73.5	78.6	83.3	88.8	93.1	98.1
Military personnel	76.1	74.4	77.5	80.3	82.9	84.8	86.4	89.6	93.9	98.0
Other branches	60.6	64.0	66.4	65.7	72.9	77.4	81.4	85.1	90.3	92.9
Gross national product	60.6	64.0	66.4	65.7	72.9	77.4	81.4	85.1	90.3	92.9

Table A-5 (Continued)

1970 = 100

Indexes of GNP by Sector of Origin

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industry	100.0	106.1	111.4	117.9	125.5	133.2	138.4	143.9	148.9	153.4	157.8
Ferrous metals	100.0	103.8	107.3	111.6	116.3	121.5	124.7	125.6	128.4	128.4	128.0
Nonferrous metals	100.0	107.0	112.7	119.6	126.9	132.9	137.1	141.3	145.9	150.2	151.4
Fuel	100.0	104.8	109.8	115.1	120.7	127.8	132.5	138.1	142.5	146.7	150.1
Electric power	100.0	108.1	115.8	123.6	131.9	140.6	150.3	155.7	162.9	167.7	175.3
Machinery	100.0	108.1	115.6	125.3	136.0	146.4	154.5	163.2	172.4	182.0	190.0
Chemicals	100.0	108.1	115.3	125.7	137.7	151.0	158.3	166.6	172.5	172.9	181.9
Wood, pulp, and paper	100.0	102.8	104.8	107.7	109.6	113.6	113.4	114.0	113.4	110.2	113.2
Construction materials	100.0	106.7	112.3	119.0	124.6	130.2	134.8	137.4	140.7	141.2	142.6
Light industry	100.0	104.5	105.3	108.2	111.1	114.3	119.0	122.1	125.2	127.4	130.0
Food industry	100.0	102.6	105.9	106.7	115.2	121.1	119.7	124.5	123.2	127.2	125.4
Other industry	100.0	106.1	111.4	117.9	125.5	133.2	138.4	143.9	148.9	153.4	157.8
Construction	100.0	106.7	112.2	118.8	125.0	131.2	135.6	138.9	143.0	144.1	147.7
Agriculture	100.0	98.3	89.9	104.8	102.5	88.9	99.1	102.5	106.1	97.3	90.2
Transportation	100.0	106.7	112.6	120.7	129.2	137.0	143.0	146.2	152.9	156.5	162.5
Communications	100.0	107.3	115.2	123.5	132.4	142.0	151.1	159.6	168.4	177.9	187.9
Trade	100.0	104.8	108.3	114.0	119.7	125.1	129.6	134.2	138.7	142.0	145.3
Services	100.0	103.7	107.4	111.0	114.7	118.2	121.2	124.2	127.9	131.8	135.8
Housing	100.0	102.7	105.5	108.4	111.2	114.1	116.8	119.5	122.2	124.8	127.4
Utilities	100.0	105.0	109.4	114.7	121.3	128.3	135.7	142.2	149.0	156.7	163.6
Repair and personal care	100.0	106.2	113.4	121.2	129.1	136.7	144.6	151.6	162.2	173.2	184.9
Recreation	100.0	102.7	104.2	106.4	108.4	109.8	108.5	109.4	112.6	114.7	117.6
Education	100.0	102.9	105.2	107.1	109.5	111.7	113.8	115.8	119.2	121.7	126.1
Health	100.0	103.4	106.2	108.5	111.3	113.4	115.6	117.1	118.5	121.7	122.8
Science	100.0	106.7	114.6	122.4	127.8	134.1	136.1	139.6	144.5	150.7	157.2
Credit and insurance	100.0	106.6	113.6	119.5	127.0	133.5	140.4	147.3	155.0	162.2	166.8
Government administrative services	100.0	104.2	108.2	111.8	116.5	120.6	124.3	127.7	132.0	135.5	139.6
General agricultural programs	100.0	106.8	111.6	116.1	120.8	126.5	138.0	141.1	149.9	155.7	164.4
Forestry	100.0	100.4	102.7	102.2	103.7	104.4	103.5	103.9	105.3	105.3	105.8
State administration and the administrative organs of social organizations	100.0	103.3	107.0	110.4	115.0	118.8	121.3	124.0	127.2	130.6	134.3
Culture	100.0	106.9	111.5	116.7	123.0	127.9	132.8	140.3	146.1	149.2	152.9
Municipal services	100.0	105.9	111.1	115.2	120.0	124.4	127.4	132.0	137.6	141.9	146.0
Civilian police	100.0	103.3	107.0	110.4	115.0	118.8	121.3	124.0	127.2	130.6	134.3
Military personnel	100.0	102.7	104.7	105.9	107.2	108.4	109.7	109.9	110.4	111.2	111.8
Other branches	100.0	103.9	105.9	113.6	118.0	120.0	125.7	129.7	134.1	135.2	137.1
Gross national product	100.0	103.9	105.9	113.6	118.0	120.0	125.7	129.7	134.1	135.2	137.1

Table A-6 Billion 1970 Rubles

GNP by End Use

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	80.1	80.6	85.5	91.1	96.2	101.6	106.4	113.7	121.7	127.2
Consumer goods	50.3	49.9	53.6	58.1	61.6	65.1	68.6	74.3	80.2	83.3
Food	42.9	41.5	44.7	47.9	49.5	52.3	54.7	59.1	63.7	65.6
Animal products	21.3	21.6	22.2	23.4	24.6	25.3	27.5	30.2	34.3	35.8
Processed foods	2.7	3.5	3.9	4.7	3.9	4.8	5.2	5.4	5.6	5.9
Basic foods	17.0	14.2	16.1	17.1	17.9	18.7	18.4	19.5	19.6	19.8
Beverages	1.9	2.2	2.4	2.7	3.1	3.4	3.6	4.0	4.2	4.2
Soft goods	6.3	7.2	7.6	8.4	9.8	10.3	11.2	11.9	12.8	13.7
Durables	1.0	1.2	1.4	1.8	2.3	2.5	2.7	3.3	3.6	3.9
Consumer services	29.8	30.7	31.8	33.0	34.6	36.5	37.8	39.4	41.6	44.0
Housing	13.0	13.3	13.7	14.0	14.5	14.9	15.5	16.1	17.0	18.0
Utilities	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6
Transportation	0.9	1.0	1.1	1.2	1.4	1.6	1.7	2.0	2.2	2.4
Communications	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8
Repair and personal care	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.5
Recreation	1.4	1.5	1.6	1.6	1.8	2.1	2.2	2.3	2.5	2.6
Education	7.4	7.5	7.8	8.0	8.3	8.7	8.9	9.2	9.4	9.7
Health	3.9	4.0	4.1	4.4	4.8	5.2	5.4	5.7	6.0	6.4
Investment	19.0	22.6	22.7	26.2	28.1	34.1	38.8	43.3	48.1	53.4
New fixed investment	16.1	19.4	19.2	22.3	23.9	28.9	32.6	36.3	40.1	44.0
Machinery and equipment	3.5	3.5	3.8	4.0	4.7	5.8	7.3	8.0	9.0	9.8
Construction and other capital outlays	12.3	14.2	15.9	17.4	19.3	21.4	22.7	24.8	28.0	31.6
Net additions to livestock	0.3	1.7	−0.5	0.9	−0.2	1.7	2.6	3.5	3.1	2.7
Capital repair	2.9	3.2	3.5	3.9	4.3	5.2	6.2	7.1	7.9	9.3
Other government expenditures	34.5	34.5	37.7	36.1	36.3	38.8	43.9	39.2	41.4	42.8
Government administrative services	10.4	10.4	10.4	10.0	9.3	8.3	8.1	7.7	7.8	7.6
General agricultural programs	0.7	0.7	0.8	0.7	0.8	0.5	0.6	0.6	0.7	0.7
Forestry	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6
State administration and the administrative organs of social organizations	6.0	5.9	5.8	5.6	5.0	4.4	4.2	4.0	4.0	3.8
Culture	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Municipal services	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Civilian police	1.9	1.8	1.8	1.7	1.6	1.4	1.3	1.2	1.2	1.2
Research and development	2.2	2.4	2.6	2.7	2.9	3.1	3.6	3.9	4.5	5.0
Outlays n.e.c.	21.9	21.6	24.7	23.3	24.2	27.4	32.3	27.5	29.1	30.2
Gross national product	133.6	137.7	145.8	153.4	160.7	174.5	189.1	196.2	211.2	223.4

Table A-6 (Continued)

Billion 1970 Rubles

GNP by End Use

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	133.9	137.8	143.3	150.0	152.1	160.3	169.0	178.8	189.5	198.6
Consumer goods	87.5	89.1	92.0	96.2	95.3	100.5	106.4	113.2	120.8	127.0
Food	68.3	69.3	71.5	75.6	73.7	77.2	80.9	85.4	90.4	94.3
Animal products	37.8	38.1	38.9	42.8	39.1	41.2	44.4	47.2	50.5	53.1
Processed foods	6.4	6.7	7.1	7.4	8.0	8.4	8.5	9.0	9.4	9.9
Basic foods	19.8	19.9	20.4	19.9	20.7	21.3	21.3	21.9	22.6	22.4
Beverages	4.4	4.7	5.1	5.5	5.8	6.2	6.7	7.3	7.9	8.9
Soft goods	14.8	15.3	15.8	15.9	16.4	17.5	19.0	20.7	22.5	24.2
Durables	4.5	4.5	4.8	4.8	5.2	5.8	6.5	7.1	7.8	8.5
Consumer services	46.4	48.6	51.2	53.8	56.8	59.8	62.7	65.6	68.8	71.6
Housing	19.0	20.0	20.9	21.7	22.5	23.2	23.9	24.7	25.5	26.2
Utilities	1.7	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4
Transportation	2.7	2.9	3.3	3.6	3.9	4.3	4.8	5.3	5.8	6.2
Communications	0.9	1.0	1.0	1.1	1.1	1.3	1.4	1.5	1.7	1.8
Repair and personal care	2.5	2.3	2.3	2.4	2.6	2.9	3.2	3.5	3.9	4.2
Recreation	2.7	2.8	2.9	2.9	3.1	3.2	3.3	3.5	3.6	3.6
Education	10.2	10.8	11.7	12.6	13.4	14.2	14.9	15.5	16.2	16.8
Health	6.8	7.0	7.1	7.4	7.7	8.1	8.4	8.6	9.0	9.4
Investment	56.2	62.5	65.1	60.0	74.0	80.9	81.6	84.7	90.2	96.0
New fixed investment	46.4	51.9	53.5	46.8	59.7	65.7	66.0	68.7	73.3	78.5
Machinery and equipment	10.8	11.8	13.2	14.6	16.6	17.8	18.8	20.2	21.8	22.8
Construction and other capital outlays	34.1	35.6	37.4	38.8	40.5	43.6	45.4	49.6	52.3	54.9
Net additions to livestock	1.5	4.5	2.9	-6.6	2.6	4.3	1.7	-1.1	-0.8	0.8
Capital repair	9.8	10.6	11.6	13.2	14.4	15.2	15.7	16.0	16.9	17.6
Other government expenditures	42.1	45.0	46.2	41.6	53.2	55.6	61.2	62.8	66.2	61.2
Government administrative services	7.5	7.4	7.6	7.6	7.9	8.4	8.8	9.4	10.0	10.5
General agricultural programs	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0
Forestry	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6
State administration and the administrative organs of social organizations	3.6	3.6	3.6	3.6	3.7	4.0	4.2	4.5	4.7	5.0
Culture	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4
Municipal services	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
Civilian police	1.1	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.5
Research and development	5.7	6.3	7.0	7.6	8.3	8.7	9.3	9.7	10.3	11.0
Outlays n.e.c.	29.0	31.2	31.6	26.5	37.0	38.5	43.1	43.7	45.9	39.7
Gross national product	232.3	245.3	254.5	251.7	279.4	296.8	311.9	326.3	346.0	355.9

Table A-6 (Continued) Billion 1970 Rubles

GNP by End Use

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Consumption	207.8	215.3	220.4	229.5	238.1	247.5	253.0	260.4	268.0	275.5	281.8
Consumer goods	133.1	138.0	140.6	146.9	152.4	158.7	161.6	166.8	171.2	175.8	179.2
Food	97.8	100.1	100.3	104.7	108.0	111.3	111.6	114.2	116.8	119.1	119.4
Animal products	54.7	55.8	56.8	59.7	62.0	64.7	64.6	65.4	66.7	68.4	68.5
Processed foods	10.3	10.5	10.7	11.3	11.7	11.7	12.3	12.7	13.2	13.4	13.6
Basic foods	23.5	24.3	23.4	24.3	24.1	24.2	23.7	25.0	25.4	25.2	24.7
Beverages	9.3	9.5	9.5	9.3	10.2	10.7	11.0	11.0	11.6	12.1	12.6
Soft goods	25.9	27.1	27.9	28.8	29.8	31.5	33.0	34.1	35.0	36.5	38.3
Durables	9.4	10.7	12.4	13.4	14.5	16.0	17.0	18.6	19.4	20.2	21.5
Consumer services	74.6	77.3	79.8	82.5	85.7	88.7	91.5	93.6	96.8	99.7	102.6
Housing	27.0	27.7	28.4	29.2	30.0	30.7	31.5	32.2	32.9	33.6	34.3
Utilities	3.6	3.9	4.2	4.4	4.7	4.9	5.2	5.5	5.7	5.9	6.2
Transportation	6.7	7.1	7.6	8.1	8.7	9.4	9.9	9.9	10.3	10.7	11.2
Communications	1.9	2.1	2.2	2.4	2.6	2.7	2.9	3.1	3.3	3.4	3.6
Repair and personal care	4.6	4.9	5.2	5.6	5.9	6.3	6.7	7.0	7.5	8.0	8.6
Recreation	3.7	3.8	3.8	3.9	3.9	4.0	3.9	3.9	4.0	4.1	4.2
Education	17.2	17.7	18.0	18.4	18.9	19.4	19.9	20.4	21.0	21.4	22.0
Health	9.9	10.2	10.4	10.6	10.9	11.2	11.4	11.7	12.0	12.3	12.4
Investment	108.2	113.4	118.2	129.1	137.6	140.6	151.8	159.5	165.5	168.3	173.3
New fixed investment	89.7	92.8	95.7	103.5	109.9	113.3	121.9	127.3	131.3	133.1	136.6
Machinery and equipment	25.6	27.0	29.2	31.4	34.6	39.0	42.8	45.2	49.0	51.1	53.5
Construction and other capital outlays	59.6	63.4	66.6	70.1	73.3	76.4	78.3	79.2	80.8	81.3	83.0
Net additions to livestock	4.4	2.4	−0.1	2.0	2.0	−2.1	0.8	2.8	1.5	0.7	0.1
Capital repair	18.5	20.6	22.5	25.6	27.7	27.2	29.9	32.3	34.2	35.2	36.7
Other government expenditures	67.3	69.4	67.1	76.7	76.6	71.7	76.8	77.1	80.7	74.4	70.3
Government administrative services	10.7	11.2	11.6	12.0	12.5	12.9	13.3	13.7	14.1	14.5	14.9
General agricultural programs	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7
Forestry	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
State administration and the administrative organs of social organizations	5.1	5.2	5.4	5.6	5.8	6.0	6.2	6.3	6.4	6.6	6.8
Culture	1.5	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.3	2.4
Municipal services	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3
Civilian police	1.6	1.6	1.7	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.1
Research and development	12.0	12.8	13.8	14.7	15.4	16.1	16.3	16.8	17.4	18.1	18.9
Outlays n.e.c.	44.5	45.4	41.7	49.9	48.7	42.7	47.1	46.6	49.2	41.7	36.4
Gross national product	383.3	398.2	405.7	435.2	452.2	459.7	481.6	497.0	514.1	518.2	525.4

Table A-7

Percent

Average Annual Rates of Growth of GNP by End Use

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Consumption	4.9	5.7	3.7	5.3	3.6	2.6
Consumer goods	5.3	6.1	2.8	5.8	3.6	2.5
Food	4.0	5.5	2.5	4.8	2.6	1.4
Animal products	3.6	8.3	1.8	5.8	3.4	1.1
Processed foods	12.3	5.9	5.8	4.1	2.7	2.9
Basic foods	1.9	1.1	1.5	1.9	0.5	0.5
Beverages	12.1	5.0	7.2	8.5	2.8	3.3
Soft goods	10.3	7.4	3.4	8.2	4.0	4.0
Durables	19.4	12.5	5.4	10.2	11.1	6.2
Consumer services	4.2	4.9	5.2	4.5	3.5	3.0
Housing	2.9	5.0	4.0	3.1	2.7	2.2
Utilities	5.9	6.6	9.5	6.7	6.3	4.7
Transportation	12.0	10.8	10.0	9.1	7.1	3.5
Communications	8.1	7.0	7.1	8.9	7.3	5.8
Repair and personal care	2.0	2.9	3.4	9.5	6.7	6.4
Recreation	8.9	4.8	3.7	2.6	1.6	1.1
Education	3.3	3.3	6.8	4.0	2.4	2.6
Health	6.1	5.3	3.6	4.2	2.4	2.1
Investment	12.4	10.5	7.6	6.0	5.4	4.3
New fixed investment	12.4	9.9	7.2	6.4	4.8	3.8
Machinery and equipment	10.8	13.4	10.4	7.6	8.7	6.5
Construction and other capital outlays	11.6	9.7	5.1	6.4	5.1	1.7
Net additions to livestock	44.2	−3.0	24.0	0.4	NA	NA
Capital repair	12.2	13.7	9.1	4.0	8.0	6.1
Other government expenditures	2.4	1.7	5.7	3.9	1.3	−0.4
Government administrative services	−4.5	−2.0	2.2	5.2	3.8	2.9
General agricultural programs	−4.5	9.7	−1.3	4.8	7.8	5.4
Forestry	−2.8	−4.0	1.3	1.7	0.9	0.3
State administration and the administrative organs of social organizations	−6.0	−4.1	2.2	4.9	3.5	2.5
Culture	3.5	1.6	5.5	8.4	5.0	3.6
Municipal services	2.7	1.4	3.4	5.3	4.5	3.3
Civilian police	−6.0	−4.1	2.2	4.9	3.5	2.3
Research and development	7.5	12.5	9.0	6.7	6.0	3.2
Outlays n.e.c.	4.5	1.1	5.9	2.9	−0.9	−3.1
Gross national product	5.5	5.9	5.0	5.2	3.7	2.7

Table A-8

Percent

Annual Growth Rates of GNP by End Use

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Consumption	0.7	6.0	6.7	5.6	5.6	4.7	6.9	7.0	4.5	5.3
Consumer goods	−0.7	7.5	8.4	5.9	5.7	5.4	8.3	7.9	3.9	5.1
Food	−3.2	7.6	7.3	3.2	5.6	4.6	8.1	7.8	2.1	4.0
Animal products	1.6	2.7	5.5	5.0	3.0	8.4	10.0	13.4	4.5	5.5
Processed foods	32.3	10.8	20.3	−18.0	23.4	9.2	3.4	4.6	4.9	7.5
Basic foods	−16.6	13.6	5.8	5.3	4.2	−1.8	5.9	0.7	0.8	0.1
Beverages	11.9	11.6	12.4	12.5	12.2	4.3	10.7	5.2	−0.3	5.2
Soft goods	13.4	5.6	10.9	16.4	5.4	8.4	6.6	7.6	6.3	8.1
Durables	16.4	14.3	30.6	27.8	9.3	9.4	21.1	9.9	9.2	13.2
Consumer services	3.1	3.6	3.7	4.9	5.4	3.5	4.3	5.4	5.8	5.5
Housing	2.6	2.7	2.7	2.9	3.2	3.5	4.3	5.3	5.9	5.8
Utilities	6.3	6.6	5.7	5.4	5.6	5.7	5.2	7.5	7.7	6.9
Transportation	11.2	10.0	11.9	11.8	15.4	7.2	14.1	11.6	9.8	11.5
Communications	9.3	9.0	6.4	8.2	7.5	7.7	7.7	5.8	6.4	7.6
Repair and personal care	1.7	1.9	2.1	2.2	2.4	−2.5	−0.9	6.6	15.3	−2.8
Recreation	6.0	6.4	4.7	11.6	16.2	5.4	4.6	7.8	2.6	3.8
Education	2.4	3.1	2.6	4.2	4.2	2.9	2.5	3.0	3.1	5.2
Health	2.0	4.7	6.8	8.9	8.2	3.9	5.3	5.5	5.8	6.2
Investment	18.9	0.3	15.5	7.5	21.2	13.8	11.8	11.0	11.0	5.3
New fixed investment	20.5	−1.0	16.1	7.0	21.2	12.8	11.2	10.6	9.7	5.3
Machinery and equipment	0.0	9.1	5.6	18.4	22.2	25.5	10.1	13.2	8.1	10.8
Construction and other capital outlays	14.9	11.9	9.6	11.1	10.8	6.1	9.2	12.8	12.8	7.9
Net additions to livestock	528.3	NA	NA	NA	NA	53.0	32.0	NA	NA	NA
Capital repair	10.2	8.3	11.9	10.1	20.9	19.1	14.7	12.6	17.3	5.4
Other government expenditures	−0.2	9.4	−4.3	0.7	6.8	13.3	−10.8	5.6	3.4	−1.6
Government administrative services	−0.1	−0.1	−3.8	−7.4	−10.6	−2.0	−4.6	1.0	−2.7	−1.7
General agricultural programs	8.4	7.5	−8.5	3.7	−27.9	9.0	−4.1	18.7	5.5	21.5
Forestry	1.7	1.7	−10.1	−3.5	−3.4	−2.2	−5.6	−3.3	−6.7	−1.9
State administration and the administrative organs of social organizations	−1.5	−1.5	−3.5	−10.7	−12.0	−3.8	−5.8	−0.7	−4.3	−5.9
Culture	3.4	3.2	2.5	4.5	4.0	1.0	1.5	2.5	1.3	1.7
Municipal services	3.9	3.7	2.1	2.0	1.9	2.6	0.9	1.2	0.7	1.8
Civilian police	−1.5	−1.5	3.5	−10.7	−12.0	−3.8	−5.8	−0.7	−4.3	−5.9
Research and development	9.9	8.2	5.0	5.8	9.0	13.2	10.8	13.3	10.9	14.4
Outlays n.e.c.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross national product	3.1	5.9	5.2	4.7	8.6	8.4	3.8	7.6	5.8	4.0

Table A-8 (Continued)

Percent

Annual Growth Rates of GNP by End Use

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Consumption	2.9	4.0	4.7	1.4	5.4	5.5	5.8	6.0	4.8	4.6
Consumer goods	1.8	3.3	4.5	−0.9	5.4	5.9	6.4	6.7	5.2	4.8
Food	1.5	3.1	5.7	−2.4	4.7	4.7	5.6	5.8	4.4	3.6
Animal products	0.8	2.1	10.1	−8.6	5.3	7.7	6.4	6.9	5.3	2.9
Processed foods	4.6	6.4	4.2	9.2	4.5	1.2	5.8	4.2	5.2	4.1
Basic foods	0.9	2.3	−2.4	4.2	2.9	−0.3	2.9	3.5	−1.2	5.0
Beverages	6.2	10.2	6.5	6.0	7.3	7.5	9.2	7.9	13.5	4.4
Soft goods	3.4	3.5	0.5	3.1	6.8	8.8	8.9	8.8	7.5	7.0
Durables	1.7	5.1	−0.4	9.9	11.2	11.8	8.6	10.9	7.9	11.7
Consumer services	4.8	5.3	5.1	5.5	5.3	4.8	4.7	4.9	4.1	4.2
Housing	5.0	4.4	4.0	3.5	3.3	3.2	3.2	3.1	2.9	2.8
Utilities	9.9	10.2	9.6	9.2	8.5	6.9	6.3	7.1	7.0	6.5
Transportation	9.6	12.9	10.3	8.2	9.3	11.1	9.8	9.6	7.4	7.5
Communications	5.9	6.2	5.9	7.1	10.4	10.5	10.3	7.2	8.7	7.5
Repair and personal care	−6.8	−0.4	3.1	9.9	12.3	10.7	10.5	9.9	7.4	9.0
Recreation	4.0	2.5	0.5	8.0	3.9	0.5	6.1	4.3	1.0	1.5
Education	6.1	8.1	7.0	6.9	5.8	4.9	3.9	4.6	3.8	2.7
Health	3.7	1.7	4.3	3.8	4.7	4.0	3.0	4.4	3.9	6.0
Investment	11.2	4.1	−7.7	23.3	9.3	0.9	3.7	6.5	6.4	12.7
New fixed investment	12.0	3.0	−12.5	27.5	10.2	0.3	4.2	6.6	7.1	14.3
Machinery and equipment	8.7	12.5	10.3	13.7	7.0	5.9	7.3	7.8	4.8	12.4
Construction and other capital outlays	4.6	4.9	3.7	4.5	7.8	4.1	9.2	5.5	4.9	8.6
Net additions to livestock	205.7	NA	NA	NA	68.3	NA	NA	NA	NA	450.3
Capital repair	7.8	9.3	14.3	8.6	5.8	3.1	1.8	6.2	3.6	5.6
Other government expenditures	6.8	2.8	−9.9	27.8	4.5	10.1	2.6	5.4	−7.6	10.0
Government administrative services	−0.9	2.1	0.5	4.2	5.5	5.4	7.0	5.6	5.1	2.7
General agricultural programs	−9.7	−1.4	−1.4	3.7	2.9	5.9	9.4	7.5	1.5	−0.1
Forestry	0.7	2.9	2.3	1.8	−1.3	2.2	1.0	2.4	1.4	1.4
State administration and the administrative organs of social organizations	−0.5	1.6	−0.8	4.0	7.0	5.9	6.6	4.9	5.4	1.9
Culture	3.2	6.4	5.4	6.8	5.6	4.8	10.0	10.1	8.8	8.3
Municipal services	1.1	3.3	3.9	5.1	3.7	4.8	7.7	4.9	4.9	3.9
Civilian police	−0.5	1.6	−0.8	4.0	7.0	5.9	6.6	4.9	5.4	1.9
Research and development	11.8	11.1	7.9	8.8	3.4	6.6	4.2	6.9	6.9	8.7
Outlays n.e.c.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross national product	5.6	3.8	−1.1	11.0	6.3	5.1	4.6	6.0	2.9	7.7

Table A-8 (Continued)

Percent

Annual Growth Rates of GNP by End Use

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Consumption	3.6	2.4	4.1	3.7	3.9	2.3	2.9	2.9	2.8	2.3
Consumer goods	3.6	1.9	4.5	3.7	4.2	1.8	3.2	2.6	2.7	1.9
Food	2.4	0.1	4.4	3.2	3.1	0.3	2.3	2.3	2.0	0.2
Animal products	2.1	1.7	5.2	3.9	4.2	−0.1	1.3	1.9	2.6	0.1
Processed foods	2.3	1.5	6.2	2.9	0.7	4.4	3.7	3.5	1.9	1.1
Basic foods	3.6	−4.1	4.0	−0.8	0.3	−1.7	5.3	1.5	−0.8	−1.7
Beverages	1.3	0.1	−1.4	9.2	5.2	2.4	0.5	5.0	4.5	4.3
Soft goods	4.7	3.0	3.2	3.5	5.5	4.7	3.3	2.9	4.2	4.8
Durables	13.5	15.4	8.4	8.4	9.7	6.6	9.2	4.2	4.1	6.8
Consumer services	3.6	3.3	3.4	3.8	3.6	3.1	2.3	3.4	3.0	2.9
Housing	2.7	2.7	2.7	2.6	2.6	2.4	2.3	2.3	2.1	2.1
Utilities	6.8	6.6	6.2	6.1	5.8	6.0	3.9	4.8	4.1	4.5
Transportation	6.9	7.4	5.8	8.0	7.6	5.9	−0.5	3.9	4.4	3.8
Communications	7.3	7.4	7.2	7.2	7.2	6.4	5.7	5.5	5.6	5.6
Repair and personal care	6.4	7.0	7.2	6.7	6.1	5.9	4.9	7.2	7.0	6.9
Recreation	2.3	1.0	1.9	1.5	1.0	−1.6	0.4	2.6	1.7	2.5
Education	2.9	1.3	2.2	2.9	2.8	2.3	2.4	3.1	2.2	2.8
Health	2.3	2.1	2.4	3.0	2.2	2.1	2.3	3.2	2.5	0.7
Investment	4.8	4.2	9.2	6.6	2.2	8.0	5.1	3.7	1.7	3.0
New fixed investment	3.5	[illegible]	8.2	6.2	3.2	7.6	4.4	3.1	1.4	2.6
Machinery and equipment	5.3	8.2	7.6	10.0	12.8	9.7	5.7	8.4	4.3	4.7
Construction and other capital outlays	6.4	5.0	5.2	4.6	4.3	2.4	1.2	1.9	0.7	2.1
Net additions to livestock	NA	NA	NA	NA	NA	NA	236.8	NA	NA	NA
Capital repair	11.4	9.1	13.6	8.3	−1.7	9.6	8.0	6.1	2.9	4.2
Other government expenditures	3.2	−3.4	14.2	−0.1	−6.3	7.1	0.4	4.6	−7.8	−5.5
Government administrative services	4.2	3.8	3.3	4.2	3.4	3.0	2.8	3.3	2.6	3.0
General agricultural programs	6.8	4.5	4.0	4.1	4.6	9.1	2.3	6.2	3.9	5.6
Forestry	0.4	2.3	−0.5	1.4	0.7	−0.9	0.4	1.3	0.0	0.4
State administration and the administrative organs of social organizations	3.3	3.5	3.2	4.2	3.3	2.2	2.2	2.5	2.7	2.9
Culture	6.9	4.2	4.7	5.4	4.0	3.9	5.6	4.1	2.2	2.4
Municipal services	5.4	4.9	3.7	4.2	3.7	2.4	3.6	4.3	3.2	2.8
Civilian police	3.3	3.5	3.2	4.2	3.3	2.2	2.2	2.5	2.7	2.9
Research and development	6.7	7.4	6.8	4.4	4.9	1.4	2.6	3.5	4.3	4.3
Outlays n.e.c.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross national product	3.9	1.9	7.3	3.9	1.7	4.8	3.2	3.4	0.8	1.4

Table A-9 1970 Rubles

Per Capita GNP by End Use

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	444.6	440.5	459.4	479.7	498.4	517.9	532.7	559.7	588.6	604.5
Consumer goods	279.2	272.7	288.4	306.0	319.0	331.7	343.4	365.6	387.6	395.5
Food	238.3	226.9	240.2	252.3	256.4	266.4	273.7	290.7	308.0	311.9
Animal products	118.2	118.2	119.4	123.4	127.5	129.2	137.6	148.8	165.7	170.1
Processed foods	14.9	19.3	21.1	24.8	20.1	24.4	26.1	26.5	27.3	28.1
Basic foods	94.5	77.5	86.7	89.7	93.0	95.3	92.0	95.8	94.7	93.9
Beverages	10.8	11.9	13.1	14.4	15.9	17.6	18.0	19.6	20.2	19.8
Soft goods	35.2	39.3	40.8	44.3	50.8	52.6	56.1	58.7	62.1	64.9
Durables	5.7	6.5	7.3	9.4	11.8	12.7	13.6	16.2	17.5	18.8
Consumer services	165.4	167.7	171.0	173.7	179.5	186.2	189.3	194.0	201.0	209.0
Housing	72.0	72.7	73.5	73.9	74.9	76.1	77.4	79.3	82.1	85.5
Utilities	5.1	5.3	5.6	5.8	6.0	6.2	6.4	6.7	7.0	7.4
Transportation	5.0	5.5	6.0	6.5	7.2	8.1	8.6	9.6	10.5	11.4
Communications	2.4	2.6	2.8	2.9	3.1	3.3	3.5	3.7	3.8	4.0
Repair and personal care	10.7	10.7	10.7	10.7	10.8	10.9	10.4	10.1	10.6	12.0
Recreation	7.7	8.0	8.4	8.6	9.5	10.8	11.2	11.5	12.2	12.3
Education	40.9	41.2	41.8	42.0	43.1	44.2	44.7	45.0	45.6	46.2
Health	21.5	21.6	22.3	23.3	24.9	26.6	27.1	28.1	29.1	30.2
Gross national product	741.7	752.2	784.0	807.3	832.4	889.2	946.8	965.7	1,021.1	1,061.2
Population (million)	180.1	183.0	186.0	190.0	193.0	196.2	199.7	203.2	206.8	210.5

Table A-9 (Continued)

1970 Rubles

Per Capita GNP by End Use

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	625.0	631.7	646.1	666.4	666.8	694.1	724.0	757.6	795.3	825.6
Consumer goods	408.5	408.7	415.2	427.3	417.9	435.2	455.6	479.7	506.7	528.0
Food	318.7	317.9	322.4	335.6	323.3	334.4	346.3	362.0	379.3	392.1
Animal products	176.3	174.6	175.3	90.1	171.6	178.5	90.1	200.1	211.8	220.9
Processed foods	29.7	30.5	31.9	32.8	35.3	36.5	36.5	38.2	39.4	41.1
Basic foods	92.3	91.4	92.0	88.4	90.9	92.4	91.1	92.8	95.0	93.0
Beverages	20.5	21.4	23.2	24.3	25.4	26.9	28.7	31.0	33.1	37.2
Soft goods	68.9	70.0	71.2	70.5	71.7	75.6	81.4	87.8	94.6	100.7
Durables	20.9	20.8	21.5	21.1	22.9	25.2	27.9	29.9	32.9	35.1
Consumer services	216.5	223.0	231.0	239.2	249.0	259.0	268.4	277.9	288.6	297.6
Housing	88.8	91.6	94.1	96.3	98.4	100.4	102.5	104.6	106.9	109.0
Utilities	7.8	8.4	9.1	9.9	10.6	11.4	12.0	12.7	13.4	14.2
Transportation	12.5	13.4	14.9	16.2	17.3	18.7	20.5	22.3	24.2	25.7
Communications	4.2	4.4	4.6	4.8	5.0	5.5	6.0	6.5	6.9	7.5
Repair and personal care	11.5	10.5	10.3	10.4	11.3	12.6	13.8	15.0	16.4	17.4
Recreation	12.6	12.8	12.9	12.8	13.7	14.0	13.9	14.6	15.1	15.1
Education	47.7	49.7	52.9	55.8	58.8	61.5	63.7	65.5	67.9	69.8
Health	31.5	32.1	32.1	33.0	33.8	35.0	35.9	36.6	37.8	38.9
Gross national product	1,083.8	1,124.6	1,148.1	1,118.1	1,224.7	1,285.5	1,335.9	1,382.6	1,451.8	1,479.0
Population (million)	214.3	218.1	221.7	225.1	228.1	230.9	233.5	236.0	238.3	240.6

Table A-9 (Continued) 1970 Rubles

Per Capita GNP by End Use

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Consumption	855.7	878.5	890.6	918.7	944.4	972.4	985.4	1,005.4	1,025.5	1,046.0	1,061.5
Consumer goods	548.4	563.0	568.0	588.2	604.5	623.7	629.1	644.0	655.2	667.4	674.9
Food	402.7	408.6	405.1	419.1	428.4	437.3	434.5	440.7	446.9	452.2	449.7
Animal products	225.1	227.7	229.4	239.1	246.1	254.1	251.5	252.6	255.1	259.7	257.9
Processed foods	42.4	42.9	43.2	45.4	46.3	46.2	47.7	49.1	50.3	50.9	51.0
Basic foods	96.8	99.3	94.4	97.2	95.5	94.9	92.5	96.5	97.1	95.6	93.2
Beverages	38.5	38.6	38.3	37.4	40.5	42.1	42.8	42.6	44.4	46.0	47.6
Soft goods	106.7	110.7	112.9	115.4	118.4	123.7	128.4	131.5	134.1	138.7	144.1
Durables	38.9	43.7	50.0	53.7	57.7	62.7	66.3	71.7	74.1	76.6	81.1
Consumer services	307.3	315.5	322.6	330.5	339.9	348.7	356.3	361.5	370.4	378.5	386.5
Housing	111.0	113.0	114.9	116.9	118.9	120.8	122.6	124.3	126.0	127.7	129.3
Utilities	15.0	15.9	16.8	17.6	18.6	19.4	20.4	21.1	21.9	22.6	23.4
Transportation	27.4	29.0	30.9	32.4	34.6	36.9	38.7	38.2	39.4	40.8	42.0
Communications	8.9	8.5	9.0	9.6	10.2	10.8	11.4	11.9	12.5	13.1	13.7
Repair and personal care	18.8	19.8	21.0	22.3	23.6	24.8	26.0	27.1	28.8	30.5	32.4
Recreation	15.2	15.4	15.4	15.6	15.7	15.7	15.3	15.2	15.5	15.6	15.9
Education	71.0	71.8	72.6	73.6	75.0	76.4	77.4	78.6	80.3	81.4	83.0
Health	40.9	41.5	41.9	42.5	43.4	43.9	44.4	45.1	46.1	46.9	46.8
Gross national product	1,578.5	1,624.6	1,639.3	1,742.2	1,793.7	1,806.5	1,875.4	1,919.1	1,967.5	1,967.3	1,978.9
Population (million)	242.8	245.1	247.5	249.8	252.1	254.5	256.8	259.0	261.3	263.4	265.5

Table A-10

Percent

Average Annual Rates of Growth of Per Capita GNP by End Use

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Consumption	3.1	3.8	2.1	4.3	2.6	1.8
Consumer goods	3.5	4.3	1.3	4.7	2.6	1.6
Food	2.3	3.7	1.0	3.8	1.7	0.6
Animal products	1.8	6.4	0.2	4.7	2.5	0.3
Processed foods	10.4	4.0	4.2	3.0	1.7	2.0
Basic foods	0.2	−0.6	0.0	0.9	−0.4	−0.4
Beverages	10.2	3.1	5.6	7.4	1.8	2.5
Soft goods	8.4	5.5	1.9	7.1	3.0	3.1
Durables	17.4	10.5	3.9	9.1	10.0	5.3
Consumer services	2.4	3.1	3.6	3.5	2.6	2.1
Housing	1.1	3.1	2.5	2.0	1.7	1.4
Utilities	4.1	4.7	7.8	5.7	5.3	3.8
Transportation	10.1	8.9	8.4	8.0	6.1	2.6
Communications	6.2	5.2	5.5	7.8	6.3	4.9
Repair and personal care	0.3	1.1	1.8	8.4	5.7	5.5
Recreation	7.1	3.0	2.2	1.6	0.6	0.3
Education	1.5	1.5	5.2	2.9	1.5	1.7
Health	4.3	3.5	2.1	3.2	1.4	1.3
Gross national product	3.7	4.0	3.5	4.2	2.7	1.8
Population	1.7	1.8	1.5	1.0	0.9	0.8

Table A-11

Percent

Percentage Shares of GNP by End Use

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	59.9	58.6	58.6	59.4	59.9	58.2	56.3	58.0	57.6	57.0
Consumer goods	37.6	36.3	36.8	37.9	38.3	37.3	36.3	37.9	38.0	37.3
Food	32.1	30.2	30.6	31.3	30.8	30.0	28.9	30.1	30.2	29.4
Animal products	15.9	15.7	15.2	15.3	15.3	14.5	14.5	15.4	16.2	16.0
Processed foods	2.0	2.6	2.7	3.1	2.4	2.7	2.8	2.7	2.7	2.6
Basic foods	12.7	10.3	11.1	11.1	11.2	10.7	9.7	9.9	9.3	8.8
Beverages	1.5	1.6	1.7	1.8	1.9	2.0	1.9	2.0	2.0	1.9
Soft goods	4.7	5.2	5.2	5.5	6.1	5.9	5.9	6.1	6.1	6.1
Durables	0.8	0.9	0.9	1.2	1.4	1.4	1.4	1.7	1.7	1.8
Consumer services	22.3	22.3	21.8	21.5	21.6	20.9	20.0	20.1	19.7	19.7
Housing	9.7	9.7	9.4	9.2	9.0	8.6	8.2	8.2	8.0	8.1
Utilities	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Transportation	0.7	0.7	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1
Communications	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Repair and personal care	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.0	1.0	1.1
Recreation	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2
Education	5.5	5.5	5.3	5.2	5.2	5.0	4.7	4.7	4.5	4.4
Health	2.9	2.9	2.8	2.9	3.0	3.0	2.9	2.9	2.8	2.8
Investment	14.2	16.4	15.5	17.1	17.5	19.5	20.5	22.1	22.8	23.9
New fixed investment	12.0	14.1	13.2	14.5	14.9	16.6	17.2	18.5	19.0	19.7
Machinery and equipment	2.6	2.5	2.6	2.6	2.9	3.3	3.8	4.1	4.3	4.4
Construction and other capital outlays	9.2	10.3	10.9	11.3	12.0	12.3	12.0	12.6	13.3	14.1
Net additions to livestock	0.2	1.3	−0.3	0.6	−0.1	1.0	1.4	1.8	1.5	1.2
Capital repair	2.2	2.3	2.4	2.5	2.7	3.0	3.3	3.6	3.8	4.2
Other government expenditures	25.8	25.0	25.9	23.5	22.6	22.2	23.2	20.0	19.6	19.2
Government administrative services	7.8	7.6	7.1	6.5	5.8	4.7	4.3	3.9	3.7	3.4
General agricultural programs	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3
Forestry	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.3
State administration and the administrative organs of social organizations	4.5	4.3	4.0	3.7	3.1	2.5	2.2	2.0	1.9	1.7
Culture	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Municipal services	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Civilian police	1.4	1.3	1.2	1.1	1.0	0.8	0.7	0.6	0.6	0.5
Research and development	1.6	1.7	1.8	1.8	1.8	1.8	1.9	2.0	2.1	2.2
Outlays n.e.c.	16.4	15.7	16.9	15.2	15.0	15.7	17.1	14.0	13.8	13.5
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-11 (Continued)

Percent

Percentage Shares of GNP by End Use

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	57.7	56.2	56.3	59.6	54.4	54.0	54.2	54.8	54.8	55.8
Consumer goods	37.7	36.3	36.2	38.2	34.1	33.9	34.1	34.7	34.9	35.7
Food	29.4	28.3	28.1	30.0	26.4	26.0	25.9	26.2	26.1	26.5
Animal products	16.3	15.5	15.3	17.0	14.0	13.9	14.2	14.5	14.6	14.9
Processed foods	2.7	2.7	2.8	2.9	2.9	2.8	2.7	2.8	2.7	2.8
Basic foods	8.5	8.1	8.0	7.9	7.4	7.2	6.8	6.7	6.5	6.3
Beverages	1.9	1.9	2.0	2.2	2.1	2.1	2.1	2.2	2.3	2.5
Soft goods	6.4	6.2	6.2	6.3	5.9	5.9	6.1	6.3	6.5	6.8
Durables	1.9	1.9	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.4
Consumer services	20.0	19.8	20.1	21.4	20.3	20.1	20.1	20.1	19.9	20.1
Housing	8.2	8.1	8.2	8.6	8.0	7.8	7.7	7.6	7.4	7.4
Utilities	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0
Transportation	1.1	1.2	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.7
Communications	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
Repair and personal care	1.1	0.9	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.2
Recreation	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.1	1.0	1.0
Education	4.4	4.4	4.6	5.0	4.8	4.8	4.8	4.7	4.7	4.7
Health	2.9	2.9	2.8	3.0	2.8	2.7	2.7	2.6	2.6	2.6
Investment	24.2	25.5	25.6	23.9	26.5	27.3	26.2	26.0	26.1	27.0
New fixed investment	20.0	21.2	21.0	18.6	21.4	22.1	21.1	21.1	21.2	22.1
Machinery and equipment	4.7	4.8	5.2	5.8	5.9	6.0	6.0	6.2	6.3	6.4
Construction and other capital outlays	14.7	14.5	14.7	15.4	14.5	14.7	14.6	15.2	15.1	15.4
Net additions to livestock	0.6	1.8	1.1	−2.6	0.9	1.5	0.6	−0.3	−0.2	0.2
Capital repair	4.2	4.3	4.5	5.3	5.1	5.1	5.0	4.9	4.9	4.9
Other government expenditures	18.1	18.3	18.2	16.5	19.0	18.7	19.6	19.2	19.1	17.2
Government administrative services	3.2	3.0	3.0	3.0	2.8	2.8	2.8	2.9	2.9	2.9
General agricultural programs	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Forestry	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
State administration and the administrative organs of social organizations	1.5	1.4	1.4	1.4	1.3	1.3	1.4	1.4	1.4	1.4
Culture	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.4	0.4	0.4
Municipal services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Civilian police	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Research and development	2.4	2.6	2.8	3.0	3.0	2.9	3.0	3.0	3.0	3.1
Outlays n.e.c.	12.5	12.7	12.4	10.5	13.3	13.0	13.8	13.4	13.3	11.1
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-11 (Continued) Percent

Percentage Shares of GNP by End Use

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Consumption	54.2	54.1	54.3	52.7	52.6	53.8	52.5	52.4	52.1	53.2	53.6
Consumer goods	34.7	34.7	34.7	33.8	33.7	34.5	33.5	33.6	33.3	33.9	34.1
Food	25.5	25.1	24.7	24.1	23.9	24.2	23.2	23.0	22.7	23.0	22.7
Animal products	14.3	14.0	14.0	13.7	13.7	14.1	13.4	13.2	13.0	13.2	13.0
Processed foods	2.7	2.6	2.6	2.6	2.6	2.6	2.5	2.6	2.6	2.6	2.6
Basic foods	6.1	6.1	5.8	5.6	5.3	5.3	4.9	5.0	4.9	4.9	4.7
Beverages	2.4	2.4	2.3	2.1	2.3	2.3	2.3	2.2	2.3	2.3	2.4
Soft goods	6.8	6.8	6.9	6.6	6.6	6.8	6.8	6.9	6.8	7.0	7.3
Durables	2.5	2.7	3.1	3.1	3.2	3.5	3.5	3.7	3.8	3.9	4.1
Consumer services	19.5	19.4	19.7	19.0	18.9	19.3	19.0	18.8	18.8	19.2	19.5
Housing	7.0	7.0	7.0	6.7	6.6	6.7	6.5	6.5	6.4	6.5	6.5
Utilities	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.2
Transportation	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.0	2.0	2.1	2.1
Communications	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Repair and personal care	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.6	1.6
Recreation	1.0	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8
Education	4.5	4.5	4.4	4.2	4.2	4.2	4.1	4.1	4.1	4.1	4.2
Health	2.6	2.6	2.6	2.4	2.4	2.4	2.4	2.3	2.3	2.4	2.4
Investment	28.2	28.5	29.1	29.7	30.4	30.6	31.5	32.1	32.2	32.5	33.0
New fixed investment	23.4	23.3	23.6	23.8	24.3	24.6	25.3	25.6	25.5	25.7	26.0
Machinery and equipment	6.7	6.5	7.2	7.2	7.6	8.5	8.9	9.1	9.5	9.9	10.2
Construction and other capital outlays	15.6	15.9	16.4	16.1	16.2	16.6	16.3	15.9	15.7	15.7	15.8
Net additions to livestock	1.2	0.6	0.0	0.5	0.4	−0.5	0.2	0.6	0.3	0.1	0.0
Capital repair	4.8	5.2	5.6	5.9	6.1	5.9	6.2	6.5	6.7	6.8	7.0
Other government expenditures	17.6	17.4	16.5	17.6	16.9	15.6	15.9	15.5	15.7	14.3	13.4
Government administrative services	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
General agricultural programs	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Forestry	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
State administration and the administrative organs of social organizations	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Culture	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Municipal services	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Civilian police	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Research and development	3.2	3.2	3.4	3.4	3.4	3.5	3.4	3.4	3.4	3.5	3.6
Outlays n.e.c.	11.6	11.4	10.3	11.5	10.8	9.3	9.8	9.4	9.6	8.1	6.9
Gross national product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-12 1970 = 100

Indexes of GNP by End Use

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	38.5	38.8	41.1	43.9	46.3	48.9	51.2	54.7	58.6	61.2
Consumer goods	37.8	37.5	40.3	43.7	46.2	48.9	51.5	55.8	60.2	62.5
Food	43.9	42.5	45.7	49.0	50.6	53.5	55.9	60.4	65.1	67.1
Animal products	38.9	39.6	40.6	42.9	45.0	46.4	50.3	55.3	62.7	65.5
Processed foods	26.0	34.4	38.2	45.9	37.7	46.5	50.7	52.4	54.8	57.5
Basic foods	72.4	60.4	68.6	72.6	76.4	79.6	78.2	82.8	83.4	84.1
Beverages	20.8	23.3	26.0	29.2	32.9	36.9	38.5	42.6	44.8	44.7
Soft goods	24.5	27.7	29.3	32.5	37.8	39.8	43.2	46.1	49.6	52.7
Durables	10.8	12.6	14.4	18.8	24.1	26.3	28.8	34.8	38.3	41.8
Consumer services	39.9	41.1	42.6	44.2	46.4	48.9	50.7	52.8	55.7	59.0
Housing	48.1	49.4	50.7	52.1	53.6	55.4	57.3	59.8	63.0	66.7
Utilities	25.1	26.6	28.4	30.0	31.6	33.4	35.3	37.1	39.9	42.9
Transportation	13.6	15.1	16.6	18.6	20.8	24.0	25.7	29.4	32.8	36.0
Communications	22.4	24.5	26.7	28.4	30.8	33.1	35.6	38.4	40.6	43.2
Repair and personal care	42.1	42.9	43.7	44.6	45.6	46.6	45.4	45.0	48.0	55.3
Recreation	37.6	39.9	42.4	44.4	49.6	57.6	60.8	63.6	68.5	70.3
Education	42.8	43.8	45.1	46.3	48.3	50.3	51.8	53.1	54.7	56.4
Health	39.0	39.8	41.7	44.5	48.5	52.5	54.5	57.4	60.6	64.1
Investment	17.6	20.9	20.9	24.2	26.0	31.5	35.8	40.0	44.4	49.3
New fixed investment	17.9	21.6	21.4	24.9	26.6	32.2	36.4	40.5	44.8	49.1
Machinery and equipment	13.5	13.5	14.8	15.6	18.4	22.5	28.3	31.1	35.2	38.1
Construction and other capital outlays	20.7	23.8	26.6	29.2	32.4	35.9	38.1	41.6	47.0	53.0
Net additions to livestock	6.2	39.1	10.4	20.3	−4.4	38.8	59.4	78.5	69.9	60.9
Capital repair	15.7	17.3	18.7	20.9	23.0	27.9	33.2	38.0	42.9	50.3
Other government expenditures	51.3	51.2	56.0	53.6	54.0	57.6	65.3	58.2	61.5	63.6
Government administrative services	97.0	97.0	96.8	93.2	86.3	77.1	75.5	72.1	72.8	70.8
General agricultural programs	66.7	72.3	77.7	71.1	73.7	53.1	57.9	55.5	65.9	69.5
Forestry	121.8	123.9	126.0	113.3	109.3	105.6	103.2	97.4	94.2	87.9
State administration and the administrative organs of social organizations	118.3	116.6	114.8	110.7	98.9	87.0	83.7	78.8	78.2	74.9
Culture	39.9	41.2	42.5	43.6	45.5	47.3	47.8	48.5	49.7	50.4
Municipal services	53.4	55.4	57.5	58.7	59.8	60.9	62.5	63.1	63.9	64.3
Civilian police	118.3	116.6	114.8	110.7	98.9	87.0	83.7	78.8	78.2	74.9
Research and development	18.2	20.0	21.6	22.7	24.0	26.2	29.6	32.8	37.2	41.3
Outlays n.e.c.	49.2	48.6	55.5	52.4	54.3	61.4	72.5	61.7	65.3	67.9
Gross national product	34.9	35.9	38.0	40.0	41.9	45.5	49.3	51.2	55.1	58.3

Table A-12 (Continued)

1970 = 100

Indexes of GNP by End Use

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	64.5	66.3	68.9	72.2	73.2	77.1	81.4	86.1	91.2	95.6
Consumer goods	65.7	66.9	69.1	72.2	71.6	75.5	79.9	85.0	90.7	95.4
Food	69.9	70.9	73.1	77.3	75.4	79.0	82.7	87.4	92.4	96.5
Animal products	69.1	69.7	71.1	78.3	71.6	75.4	81.2	86.4	92.3	97.2
Processed foods	61.8	64.7	68.9	71.7	78.4	81.9	82.8	87.6	91.3	96.1
Basic foods	84.1	84.9	86.8	84.7	88.3	90.8	90.5	93.2	96.4	95.2
Beverages	47.0	49.9	55.0	58.6	62.1	66.6	71.6	78.2	84.4	95.8
Soft goods	57.0	58.9	60.9	61.2	63.1	67.4	73.4	79.9	86.9	93.5
Durables	47.3	48.1	50.5	50.4	55.4	61.6	68.9	74.8	83.0	89.5
Consumer services	62.2	65.2	68.6	72.2	76.1	80.1	84.0	87.9	92.2	96.0
Housing	70.6	74.1	77.4	80.5	83.3	86.0	88.8	91.6	94.5	97.3
Utilities	45.9	50.4	55.5	60.9	66.5	72.1	77.1	81.9	87.7	93.9
Transportation	40.1	44.0	49.7	54.8	59.3	64.8	72.0	79.1	86.6	93.0
Communications	46.5	49.2	52.3	55.3	59.3	65.4	72.3	79.8	85.5	93.0
Repair and personal care	53.8	50.1	49.9	51.5	56.5	63.5	70.3	77.7	85.4	91.7
Recreation	73.0	75.9	77.8	78.2	84.4	87.7	88.2	93.6	97.6	98.6
Education	59.3	62.9	68.0	72.8	77.8	82.3	86.3	89.6	93.8	97.4
Health	68.0	70.5	71.7	74.8	77.6	81.3	84.5	87.0	90.8	94.3
Investment	51.9	57.8	60.1	55.5	68.4	74.8	75.5	78.3	83.4	88.7
New fixed investment	51.7	57.9	59.7	52.2	66.6	73.3	73.6	76.7	81.7	87.5
Machinery and equipment	42.2	45.9	51.6	57.0	64.8	69.3	73.4	78.7	84.8	88.9
Construction and other capital outlays	57.2	59.8	62.7	65.0	67.9	73.2	76.2	83.3	87.8	92.1
Net additions to livestock	33.4	102.2	65.1	−148.3	58.2	98.0	38.9	−23.9	−17.8	18.2
Capital repair	53.0	57.1	62.4	71.4	77.5	82.0	84.6	86.1	91.4	94.7
Other government expenditures	62.6	66.8	68.7	61.9	79.1	82.6	91.0	93.3	98.4	90.9
Government administrative services	69.6	68.9	70.3	70.7	73.7	77.7	81.9	87.7	92.6	97.4
General agricultural programs	84.5	76.4	75.3	74.2	77.0	79.2	83.9	91.7	98.6	100.1
Forestry	86.2	86.9	89.4	91.5	93.1	91.9	94.0	94.9	97.2	98.6
State administration and the administrative organs of social organizations	70.5	70.1	71.2	70.7	73.5	78.6	83.3	88.8	93.1	98.1
Culture	51.3	52.9	56.3	59.3	63.4	66.9	70.1	77.1	84.9	92.4
Municipal services	65.4	66.2	68.3	71.0	74.6	77.4	81.1	87.4	91.7	96.2
Civilian police	70.5	70.1	71.2	70.7	73.5	78.6	83.3	88.8	93.1	98.1
Research and development	47.2	52.7	58.6	63.2	68.7	72.4	77.3	80.5	86.0	92.0
Outlays n.e.c.	65.1	70.1	71.0	59.4	83.2	86.6	96.9	98.2	103.1	89.1
Gross national product	60.6	64.0	66.4	65.7	72.9	77.4	81.4	85.1	90.3	92.9

Table A-12 (Continued) 1970 = 100

Indexes of GNP by End Use

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Consumption	100.0	103.6	106.1	110.5	114.6	119.1	121.8	125.3	129.0	132.6	135.6
Consumer goods	100.0	103.6	105.6	110.4	114.5	119.2	121.3	125.3	128.6	132.0	134.6
Food	100.0	102.4	102.5	107.1	110.4	113.8	114.1	116.7	119.4	121.8	122.1
Animal products	100.0	102.1	103.9	109.3	113.5	118.3	118.2	119.7	122.0	125.2	125.3
Processed foods	100.0	102.3	103.9	110.3	113.5	114.2	119.2	123.6	127.9	130.4	131.8
Basic foods	100.0	103.6	99.4	103.3	102.5	102.8	101.0	106.4	108.0	107.1	105.3
Beverages	100.0	101.3	101.4	100.0	109.2	114.8	117.6	118.2	124.1	129.7	135.3
Soft goods	100.0	104.7	107.8	111.2	115.2	121.5	127.2	131.4	135.2	140.9	147.7
Durables	100.0	113.5	131.0	142.1	154.0	168.9	180.1	196.7	205.0	213.5	227.8
Consumer services	100.0	103.6	107.0	110.6	114.8	118.9	122.6	125.5	129.7	133.6	137.5
Housing	100.0	102.7	105.5	108.4	111.2	114.1	116.8	119.5	122.2	124.8	127.4
Utilities	100.0	106.8	113.8	120.8	128.2	135.7	143.8	149.5	156.6	163.0	170.4
Transportation	100.0	106.9	114.8	121.5	131.2	141.2	149.5	148.8	154.6	161.4	167.6
Communications	100.0	107.3	115.2	123.5	132.4	142.0	151.1	159.6	168.4	177.9	187.9
Repair and personal care	100.0	106.4	113.8	122.0	130.1	138.1	146.3	153.5	164.5	175.9	188.0
Recreation	100.0	102.3	103.4	105.4	107.0	108.0	106.3	106.7	109.5	111.4	114.3
Education	100.0	102.9	104.2	106.5	109.7	112.7	115.3	118.0	121.7	124.3	127.8
Health	100.0	102.3	104.5	107.0	110.2	112.6	114.9	117.5	121.3	124.3	125.2
Investment	100.0	104.8	109.2	119.3	127.1	129.9	140.2	147.4	152.9	155.5	160.2
New fixed investment	100.0	103.5	106.7	115.4	127.5	126.4	135.9	141.9	146.4	148.5	152.4
Machinery and equipment	100.0	105.3	113.9	122.5	134.8	152.0	166.8	176.2	191.0	199.2	208.6
Construction and other capital outlays	100.0	106.4	111.7	117.5	122.9	128.3	131.3	132.9	135.5	136.4	139.3
Net additions to livestock	100.0	53.6	−2.3	45.2	45.2	−47.7	19.1	64.2	34.6	16.9	2.6
Capital repair	100.0	111.4	121.5	138.0	149.5	147.0	161.1	174.0	134.6	189.9	197.8
Other government expenditures	100.0	103.2	99.7	113.9	113.8	106.6	114.1	114.6	119.9	110.5	104.4
Government administrative services	100.0	104.2	108.1	111.7	116.4	120.4	124.0	127.4	131.6	135.0	139.1
General agricultural programs	100.0	106.8	111.6	116.1	120.8	126.5	138.0	141.1	149.9	155.7	164.4
Forestry	100.0	100.4	102.7	102.2	103.7	104.4	103.5	103.9	105.3	105.3	105.8
State administration and the administrative organs of social organizations	100.0	103.3	107.0	110.4	115.0	118.8	121.3	124.0	127.2	130.6	134.3
Culture	100.0	106.9	111.5	116.7	123.0	127.9	132.8	140.3	146.1	149.2	152.9
Municipal services	100.0	105.9	111.1	115.2	120.0	124.4	127.4	132.0	137.6	141.9	146.0
Civilian police	100.0	103.3	107.0	110.4	115.0	118.8	121.3	124.0	127.2	130.6	134.3
Research and development	100.0	106.7	114.6	122.4	127.8	134.1	136.1	139.6	144.5	150.7	157.2
Outlays n.e.c.	100.0	102.0	93.7	112.2	109.3	95.8	105.9	104.8	110.4	93.7	81.8
Gross national product	100.0	103.9	105.9	113.6	118.0	120.0	125.7	129.7	134.1	135.2	137.1

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Appendix B

Sector-of-Origin Indexes

Industry

The derivation of the production index for each branch of industry, except for the other industry branch, is described by Ray Converse in JEC, *Industry*. The 1970 established-price weights for the branches of industry are derived in appendix D, table D-7, and the factor-cost weights are derived in appendix E. The index for the other industry branch is assumed to be equal to the index for total industry and is computed as a weighted average of the other 10 branches. The indexes for total industry and for all branches of industry are reproduced in appendix A, table A-5.

Construction

Scope and Coverage

The construction sector in Soviet statistics includes new construction and capital repair of buildings and structures, oil and gas well drilling, design work connected with the construction and capital repair of buildings and structures, and geological survey work (USSR Gosplan, *Metodicheskiye ukazaniye k sostavleniyu gosudarstvennogo plana razvitiya narodnogo khozyaystvo SSSR*, Moscow, Ekonomika, 1969, pp. 746-748, hereafter referred to as *Ukazaniya*). All construction activity is included regardless of whether it is performed by contract organizations or on force account. In recent years, about 90 percent of construction-installation work has been performed by contract organizations. In contrast to Western accounting practice, new construction and capital repair in the USSR include the cost of installing machinery and equipment.

The United States uses the double deflation method to compute a value-added index in constant prices. Gross output in current prices is deflated using price indexes for several types of construction. Then material inputs in current prices are deflated by a price index constructed as a weighted average of price indexes for the various materials used by the construction sector. Subtracting the deflated material purchases from the deflated gross output produces value added in constant prices.

Price changes are notoriously difficult to measure in construction because there are few standard products for which comparable prices exist. The Soviet Union probably collects more data on construction costs than most nations, but has not published a price index, much less one backed by sufficient data for independent testing. The lack of standard products makes it impossible to construct a physical output index. Faced with the same lack of Soviet data, Powell constructed a material-input index, consisting of a price-weighted average of the production of 28 types of construction materials, to measure real changes in the gross output of construction (Raymond P. Powell, "An Index of Soviet Construction, 1927/28 to 1955," *The Review of Economics and Statistics 41*, May 1959, pp. 170-177). The same basic approach is used here. Input-output data for 1972 are used to derive weights for the purchase of 54 types of materials by the construction sector. Similar data for 1959 and 1966 are used to estimate changes in the share of the production of each material purchased by construction over time. The share for each year is combined with the corresponding production index to form an index of purchases of that type of material by construction. The construction output index is a weighted average of the 54 purchase indexes.

This approach assumes that the ratio of material inputs to gross output is constant. The validity of this approach depends on the manner in which productivity gains have been introduced. Productivity growth can influence the output of a sector through higher quality material inputs or through the better use of labor and capital resources. If the use of improved materials permits a smaller value of materials to be used per unit of construction, then the ratio of material inputs to gross output would decline. On the other hand, if the use of improved materials permits the substitution of materials for labor and capital, then the ratio of material inputs to gross output would rise. The Soviet Union has published values for the gross output and net material product (NMP) of the construction sector for 1964-78 in current prices. The ratio of material inputs (gross output less NMP) to gross output declined slowly in this period (from 57 percent in 1964 to 54 percent in 1978), suggesting that the material-input approach is reasonably valid. This conclusion depends on the relative price stability between gross output and material inputs. The available evidence does not suggest a divergence in the prices of construction output and its inputs. In addition, US data show a stable ratio of material inputs to gross output in constant prices, ranging between 52 percent and 55 percent, since 1950. International comparisons are hazardous, but this stability also lends support to the use of a material-input index.

Weights

The weights used to combine the purchase indexes are derived from the 1972 Soviet input-output table. The construction column in that table enumerates the ruble value of purchases from each of 75 input-output sectors. The 1972 input-output table is available with 88 sectors. In order to make comparisons with the 1959 and 1966 input-output tables, however, tables in comparable 75-sector formats were used. The construction sector did not purchase any materials from 11 of these sectors in 1972. Production indexes are not available for an additional 10 sectors. The purchases by the construction sector from the remaining 54 sectors were summed and converted into percentage weights (table B-1). The construction sector purchased over half of its inputs from just two sectors—construction materials and transportation and communications. A desirable development would be to disaggregate the construction materials sector. The data needed to compute the purchase indexes for the separate construction materials sectors for other years, however, are not available.

Description of the Index

The construction index is a weighted average of 54 purchase indexes, each showing the purchases by construction from the input-output sectors listed in table B-1. Each purchase index is computed in a two-step procedure. First, the shares of the gross output of each of the 54 sectors sold to construction were computed from the 1959, 1966, and 1972 Soviet input-output tables. It is assumed that the rate of change in these shares between 1959 and 1966 and between 1966 and 1972 was linear. It is assumed also that there was no change in the shares before 1959 or after 1972. The resulting time series shows the share of each sector's gross output sold to construction. Second, the shares so derived were multiplied by the production index for that sector to arrive at an index of purchases by construction from each sector. Each purchase index was rebased so that 1972 = 100. A sample computation of a purchase index is shown in table B-2.

To form the construction index, the 54 purchase indexes are multiplied by their corresponding weights from table B-1, and the products are added. The resulting index is shown in column 2 of table B-3. All but four of the 54 production indexes are for industrial sectors and were obtained from the index of industrial production described by Ray Converse in JEC, *Industry*. The indexes for the crops and animal husbandry sectors were derived from the data contained in the index of agricultural output as described by Margaret Hughes and Barbara Severin in JEC, *Agriculture*. The index for the transportation and communications sector is the index for freight transportation derived below in this appendix. The index for the trade sector is the index for wholesale trade derived below in this appendix.

Although the material-input method is theoretically less desirable than either the gross output or double deflation method, it appears to produce reasonable results and to be the best available method given the data constraints. The material-input index can be

Table B-1

1972 Construction Input Weights

Input-Output Sector	Purchases by Construction (thousand rubles, producers' prices)	Share of Purchases (percent)
Ferrous metals	3,111,673	8.6
Nonferrous metals	205,220	0.6
Refractory materials	165,739	0.5
Coal	105,696	0.3
Oil extraction	13,358	*
Oil refining	566,432	1.6
Gas	16,730	*
Peat	6,897	*
Oil shales	7,591	*
Electric power	504,205	1.4
Energy and power m&e[a]	35,779	0.1
Electrotechnical m&e	494,980	1.4
Machine tools	9,753	*
Forge-pressing m&e	2,458	*
Precision instruments	52,269	0.1
Mining and metallurgical m&e	240,970	0.7
Pumps and chemical equipment	35,591	0.1
Logging and paper m&e	11,817	*
Hoisting and transport equipment	67,873	0.2
Construction m&e	198,056	0.5
Transport m&e	7,942	*
Automobiles	329,658	0.9
Agricultural m&e	148,592	0.4
Radioelectronics and other machine building	412,753	1.1
Sanitary engineering products	1,131,383	3.1
Other metalwares	540,714	1.5
Metal structures	1,713,201	4.7
Repair of m&e	914,314	2.5
Basic chemical products	129,655	0.4
Aniline dye products	31,056	0.1
Synthetic resins and plastics	41,847	0.1
Synthetic fibers	2,980	*
Organic-synthetic products	25,594	0.1
Paint and lacquer	610,260	1.7
Rubber products	313,506	0.9
Other chemical products	132,410	0.4
Logging	437,967	1.2
Sawmill and lumber products	3,206,976	8.9
Furniture	26,348	0.1
Paper and pulp	79,506	0.2
Wood chemistry	4,031	*
Construction materials	12,621,215	34.9
Glass	379,175	1.0
Textiles	187,357	0.5
Sewn goods	375,049	1.0
Other light industry	69,220	0.2
Meat products	11,018	*
Dairy products	7,025	*
Flour and bread	947	*
Other foods	86,257	0.2
Crops	34,820	0.1
Animal husbandry	11,718	*
Transportation and communications	5,841,370	16.1
Trade and distribution	465,452	1.3
Total	**36,176,521**	**100.0**

* = Less than 0.05 percent

[a] m&e = machinery and equipment

Source: Dimitri M. Gallik, Barry L. Kostinsky, and Vladimir G. Treml, *Input-Output Structure of the Soviet Economy: 1972*, U.S. Department of Commerce, Bureau of the Census, Washington, D.C., forthcoming

Table B-2

Derivation of the Index of Purchases of Construction Materials by the Construction Sector

Year	(1) Percent Gross Output of Construction Materials Sold to Construction	(2) Construction Materials Production Index (1972 = 100)	(3) Purchases of Construction Materials (Index 1972 = 100)
1950	74.55	10.1	9.8
1951	74.55	12.2	11.9
1952	74.55	14.3	13.9
1953	74.55	16.5	16.0
1954	74.55	19.3	18.7
1955	74.55	23.2	22.5
1956	74.55	26.0	25.2
1957	74.55	30.6	29.7
1958	74.55	37.1	36.1
1959	74.55	43.3	42.0
1960	74.63	49.1	47.8
1961	74.72	53.5	52.1
1962	74.81	56.4	55.0
1963	74.90	58.3	57.0
1964	74.99	61.0	59.6
1965	75.08	66.0	64.6
1966	75.17	71.4	70.0
1967	75.43	77.1	75.8
1968	75.69	80.2	79.1
1969	75.95	81.9	81.0
1970	76.21	88.9	88.3
1971	76.47	95.3	94.9
1972	76.73	100.0	100.0
1973	76.73	106.0	106.0
1974	76.73	110.9	110.9
1975	76.73	115.3	115.3
1976	76.73	119.5	119.5
1977	76.73	121.2	121.2
1978	76.73	123.9	123.9
1979	76.73	123.8	123.8
1980	76.73	125.1	125.1

Sources: Column 1: 1959, 1966, and 1972 are calculated from the respective input-output tables. These tables are published in Dimitri M. Gallik, Barry L. Kostinskiy, and Vladimir G. Treml, *Conversion of Soviet Input-Output Tables to Producers' Prices. The 1959 Reconstructed Table*, Foreign Economic Report 6, US Department of Commerce, Bureau of Economic Analysis, Washington D.C., 1975; Vladimir G. Treml, Dimitri M. Gallik, and Barry L. Kostinskiy, "1966 Ex-Post Input-Output Tables for the USSR: A Survey," in Vladimir G. Treml, ed., *Studies in Soviet Input-Output Analysis*, Praeger Publishers, New York, 1977, pp. 1-67; and Dimitri M. Gallik, Barry L. Kostinskiy, and Vladimir G. Treml, *Input-Output Structure of the Soviet Economy: 1972*, US Department of Commerce, Bureau of the Census, Washington, D.C., forthcoming. The values for 1950-58 are assumed to be equal to the 1959 value, and the values for 1973-80 are assumed to be equal to the 1972 value. The 1960-65 and 1967-71 values are linearly interpolated.
Column 2: This was derived from the index of industrial production described by Ray Converse in JEC, *Industry*.
Column 3: This is column 1 times column 2, rebased so that 1972 = 100.

checked for reasonableness by comparing the gross output of the construction sector in current prices, as published in the *Narkhoz*, with our index in 1970 prices and computing the implicit annual price changes and implicit price index (table B-3). On the whole, the implicit price index is reasonable. It shows price declines in the early 1950s, especially in 1955, which conform with Soviet claims of price reductions. After 1955 there is a pattern of moderate price increases with two large increases in 1967 and 1969. The 1967 industrial price reform raised the prices of construction materials, and construction prices were explicitly increased in 1969. Since 1970 remarkably little price change is indicated.

A second test compares an implicit price index derived from Soviet data with the price index derived in table B-3. First, a series showing expenditures on new construction and other capital outlays in current prices was derived by subtracting current-price estimates of capital repair of buildings and structures

Table B-3

Derivation of the Implicit Construction Price Index

Year	(1) Gross Output of Construction (billion rubles)	(2) Material-Input Construction Index (1970 = 100)	(3) Implicit Annual Price Change (percent)	(4) Implicit Price Index (1970 = 100)
1950	12.1	20.4	NA	88.1
1951	13.6	23.3	−1.9	86.4
1952	15.3	25.7	2.2	88.3
1953	16.1	28.3	−4.8	84.1
1954	18.2	31.5	1.2	85.2
1955	18.4	35.7	−10.4	76.3
1956	20.3	38.9	1.4	77.4
1957	22.6	43.1	0.3	77.7
1958	25.7	48.7	0.4	78.0
1959	29.2	54.7	1.1	78.9
1960	31.9	58.9	1.6	80.1
1961	32.7	62.0	−2.6	78.1
1962	33.6	64.9	−1.9	76.6
1963	34.7	67.4	−0.6	76.1
1964	36.6	70.9	0.4	76.4
1965	40.3	75.3	3.6	79.2
1966	43.0	78.8	2.0	80.7
1967	50.0	84.8	8.0	87.2
1968	53.0	89.3	0.7	87.8
1969	60.0	92.8	8.8	95.6
1970	67.6	100.0	4.6	100.0
1971	74.7	106.7	3.6	103.6
1972	77.4	112.2	−1.5	102.0
1973	80.9	118.8	−1.3	100.8
1974	86.4	125.0	1.5	102.2
1975	91.7	131.2	1.1	103.4
1976	94.2	135.6	−0.6	102.7
1977	96.2	138.9	−0.2	102.5
1978	99.2	143.0	0.1	102.6
1979	NA	144.1	NA	NA
1980	NA	147.7	NA	NA

Sources: Column 1: 1958-78 are from *Narkhoz 1978*, p. 41, and similar tables in other issues. 1950-57 are derived by linking a series of estimates of construction-installation work in current prices developed by Moorsteen and Powell (*The Soviet Capital Stock, 1928-1962*, p. 395, table A-7, columns 5 plus 8) to the 1958 value.
Column 2: This was described in the text.
Columns 3 and 4: Both were derived from a comparison of columns 1 and 2.

Table B-4

Derivation of an Implicit Price Index for Investment in New Construction and Other Capital Outlays

Year	(1) New Construction and Other Capital Outlays (billion rubles)	(2) Investment in New Construction (billion 1969 rubles)	(3) Implicit Annual Price Change (percent)	(4) Implicit Price Index (1970 = 100)
1961	27.9	32.2	NA	82.2
1962	28.7	32.8	1.0	83.0
1963	29.6	33.8	0	83.0
1964	31.0	36.2	−2.1	81.3
1965	34.7	39.5	2.4	83.2
1966	36.8	42.5	−1.3	82.1
1967	43.4	46.1	8.8	89.3
1968	46.1	49.7	−1.5	88.0
1969	52.6	51.1	11.0	97.7
1970	59.8	56.7	2.4	100.0
1971	65.9	61.4	1.7	101.7
1972	68.1	65.5	−3.0	98.6
1973	70.8	67.6	0.7	99.3
1974	75.2	71.6	0.2	99.5
1975	79.3	76.4	−1.1	98.4
1976	80.7	77.9	−0.2	98.2
1977	81.5	79.9	−1.6	96.7
1978	83.2	83.8	−2.6	94.1

Sources: Column 1: This was derived from table B-3, column 1 less capital repair of buildings and structures (table C-2, column 2).
Column 2: This was taken from *Narkhoz 1972*, p. 474, and similar tables in other issues.
Columns 3 and 4: These were derived from a comparison of columns 1 and 2.

from the current-price gross output series in table B-3. (See appendix C for the derivation of the capital repair series in current prices.) The resulting series is compared with the *Narkhoz* series on investment in new construction and other capital outlays in constant prices (table B-4). The implicit price index derived from this camparison (column 4 of table B-4) matches the index derived in table B-3 closely, especially the large price increases in 1967 and 1969.

Table B-5

Selected Purchases by Agriculture of Material Inputs From Nonagricultural Sectors in 1972

Material-Input Category	Input-Output Sector	Purchases by Agriculture (thousand rubles, purchasers' prices)	Share of Purchases (percent)
Mineral fertilizer		2,102,579	16.3
	Mineral chemistry products	59,649	
	Basic chemistry products	1,722,868	
	Organic synthetic products	12,570	
	Other chemicals	307,492	
Electric power	Electric power	317,298	2.5
Fuel and lubricants	Oil refining	2,240,049	17.3
Machinery repair		3,993,145	30.9
	Metallurgy	97,585	
	Machine building and metalworking	3,895,560	
Fish meal	Fish products	397,966	3.1
Bone meal	Meat products	191,769	1.5
Milling byproducts	Flour and cereals	2,758,112	21.3
Oilseed meal		168,282	1.3
	Vegetable products	57,336	
	Other foods	110,946	
Skim milk	Dairy products	608,679	4.7
Sugar beets	Sugar	151,593	1.2
Total		**12,929,472**	**100.0**

Source: See table B-1 for a reference to the 1972 input-output data.

Agriculture

Scope and Coverage

The index of net agricultural production described by Margaret Hughes and Barbara Severin (JEC, *Agriculture*) represents the gross value of agricultural output less the value of that output used within agriculture. In order to compute a value-added index for agriculture, it is necessary to subtract also the value of the materials and services purchased by agriculture on current account from nonagricultural sectors. This subtraction is described here.

The index of purchases from nonagricultural sectors is by design a material-input index similar to the construction index described above. We have been able to construct indexes of 10 types of materials purchased by agriculture. These indexes are combined using weights derived from the 1972 Soviet input-output table.

Weights

Table B-5 shows the derivation of the weights used to combine the 10 indexes of material inputs purchased from nonagricultural sectors. The 1972 Soviet input-output table shows agriculture's purchases from all sectors. Those purchases which relate to each of the 10 material-input indexes were summed and converted to percentage weights. The purchases selected in this manner represent 71 percent of agriculture's purchases from nonagricultural sectors in 1972. The most important types of inputs are fuel, machinery repair, and milling byproducts.

Table B-6

Index 1972 = 100

Derivation of the Index of Purchases of Nonagricultural Material Inputs by Agriculture

Year	Mineral Fertilizer	Electric Power	Fuel and Lubricants	Machinery Repair	Fish Meal	Bone Meal	Milling Byproducts	Oilseed Meal	Skim Milk	Sugar Beets	Total Current Purchases
1950	8.9	2.1	25.9	24.4	2.2	5.0	24.4	33.5	31.1	23.8	21.0
1951	9.5	2.6	28.4	26.8	3.3	5.5	27.8	40.7	32.9	30.6	23.4
1952	10.2	3.1	29.0	27.4	3.7	6.6	31.6	43.1	34.4	36.3	24.8
1953	10.9	3.8	34.4	32.5	4.4	8.0	36.0	45.7	35.4	34.2	28.5
1954	12.4	4.8	33.7	31.8	5.5	9.4	40.0	51.2	36.0	35.6	29.4
1955	14.0	6.1	37.4	35.3	6.6	10.2	44.3	47.3	42.9	30.3	32.6
1956	15.7	7.3	40.8	38.5	7.5	11.3	43.5	57.2	51.6	47.7	35.1
1957	17.2	9.1	45.1	42.5	7.9	13.5	47.4	61.7	58.8	48.9	38.7
1958	17.9	11.6	49.2	46.4	9.6	14.9	49.1	53.7	61.0	59.9	41.3
1959	18.5	14.3	51.9	48.9	12.7	18.2	51.6	64.2	66.8	79.3	44.1
1960	19.1	16.3	54.4	51.3	18.6	18.8	53.9	58.4	68.2	64.3	45.8
1961	20.3	19.2	57.6	54.4	23.0	21.0	62.4	60.2	72.3	81.1	50.0
1962	23.1	22.6	64.2	58.4	24.6	27.9	68.4	71.6	76.9	74.2	54.7
1963	27.8	25.5	66.8	65.0	30.5	35.6	56.5	73.1	71.9	68.3	55.5
1964	37.0	29.3	71.8	68.4	38.6	32.6	58.5	77.9	78.3	64.4	59.9
1965	46.2	34.7	74.7	73.5	52.0	45.3	68.5	86.0	99.3	118.5	68.1
1966	52.5	38.4	76.2	80.1	58.1	54.4	76.5	90.6	96.5	104.9	75.3
1967	58.4	44.1	79.2	86.6	71.3	65.5	81.6	99.8	98.1	108.4	78.8
1968	63.3	51.8	82.5	87.9	76.3	71.5	86.4	100.3	96.7	126.8	82.2
1969	69.1	61.3	86.1	90.3	82.0	68.0	88.9	100.9	88.3	130.8	85.0
1970	82.0	72.2	89.4	90.5	86.2	73.8	92.8	90.4	89.2	101.5	88.6
1971	92.1	85.9	94.8	93.3	93.6	90.3	93.3	97.7	94.6	111.0	93.5
1972	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1973	110.1	114.6	105.5	109.8	111.0	101.7	101.7	107.8	114.7	105.8	107.6
1974	122.0	132.9	111.4	120.2	124.6	119.6	103.5	98.8	116.7	120.9	115.4
1975	137.8	152.1	119.8	132.1	143.6	132.0	104.9	90.8	114.0	104.9	124.2
1976	140.7	173.2	125.7	137.6	137.1	118.0	79.7	100.6	116.9	96.2	122.3
1977	145.6	184.7	131.3	142.5	127.0	124.6	107.0	104.9	130.4	132.4	132.6
1978	148.7	200.2	138.9	149.3	115.4	131.2	105.0	95.7	127.9	131.9	135.9
1979	146.4	215.8	146.8	151.0	112.1	134.0	111.2	92.2	122.7	124.5	138.8
1980	157.4	231.3	155.2	155.1	123.7	133.4	112.9	98.3	118.2	107.7	144.1

Source: See text.

Description of the Index

Table B-6 shows the construction of the index of agriculture's purchases of nonagricultural materials. It is a weighted average of 10 indexes of separate types of materials. The indexes are derived partly from data published in the *Narkhoz* and partly from data gathered from Soviet monographs on agriculture. In particular, data for agriculture's use of mineral fertilizer and electric power are published in the *Narkhoz*. The index of use of skim milk is assumed to equal the index of industrially produced

Table B-7

Derivation of the Index of Value Added in Agriculture

Year	(1) Net Output (billion 1970 rubles)	(2) Index of Column 1 (1972 = 100)	(3) Net Output (billion 1972 rubles)	(4) Nonagricultural Material Inputs (billion 1972 rubles)	(5) Value Added (billion 1972 rubles)	(6) Index of Value Added (1970 = 100)
1950	38.1	48.5	41.2	3.9	37.3	50.4
1951	35.8	45.5	38.6	4.3	34.4	46.4
1952	37.6	47.9	40.7	4.5	36.1	48.8
1953	40.3	51.3	43.5	5.2	38.3	51.7
1954	41.2	52.4	44.5	5.4	39.1	52.8
1955	46.5	59.2	50.2	6.0	44.3	59.8
1956	52.9	67.4	57.2	6.4	50.8	68.6
1957	52.9	67.3	57.1	7.1	50.0	67.6
1958	57.2	72.8	61.8	7.6	54.2	73.2
1959	58.7	74.7	63.4	8.1	55.3	74.7
1960	58.0	73.8	62.6	8.4	54.3	73.3
1961	62.1	79.1	67.1	9.2	58.0	78.3
1962	61.3	78.1	66.2	10.0	56.2	75.9
1963	50.6	64.5	54.7	10.2	44.5	60.2
1964	64.6	82.3	69.8	11.0	58.8	79.5
1965	69.2	88.1	74.7	12.5	62.3	84.1
1966	72.3	92.1	78.1	13.4	64.7	87.4
1967	72.3	92.1	78.1	14.4	63.7	86.0
1968	76.6	97.5	82.7	15.1	67.7	91.4
1969	74.3	94.6	80.3	15.6	64.7	87.4
1970	83.6	106.4	90.3	16.2	74.0	100.0
1971	83.2	105.9	89.9	17.1	72.8	98.3
1972	78.5	100.0	84.8	18.3	66.5	89.9
1973	90.1	114.7	97.3	19.7	77.6	104.8
1974	89.8	114.4	97.1	21.1	75.9	102.5
1975	82.0	104.4	88.6	22.8	65.8	88.9
1976	88.6	112.9	95.8	22.4	73.4	99.1
1977	92.8	118.1	100.2	24.3	75.9	102.5
1978	95.8	121.9	103.5	24.9	78.6	106.1
1979	90.2	114.8	97.4	25.4	72.0	97.3
1980	86.3	109.8	93.2	26.4	66.8	90.2

Sources. Column 1: This is from JEC, *Agriculture*, table A-1.
Column 2: This is column 1 converted to index form (1972 = 100).
Column 3: This is column 2 multiplied by the base-year (1972) value of 84.8 billion rubles. The derivation of the base-year value is described in the text.
Column 4. This is column 11 of table B-6 multiplied by the base-year (1972) value of 18.3 billion rubles. The derivation of the base-year value is described in the text.
Column 5: This is column 3 less column 4.
Column 6: This is column 5 converted to index form (1970 = 100).

butter, and the index of sugar beets is assumed to equal the index of state procurements of sugar beets. The other indexes are estimated from a variety of sources. The detailed derivation of each index is too extensive to present here.

Table B-7 shows the computation of the index of value added in agriculture. This calculation also is based on the 1972 input-output table. First an index of net agricultural output is computed in 1972 prices by multiplying the 1972 value derived from the input-output table by the index derived by Hughes and Severin in 1970 prices (JEC, *Agriculture*, table A-1). The 1972 value of net agricultural output is computed as follows:

		Billion Rubles
	Gross output of agriculture in purchasers' prices	114.7
Less	Purchases from the trade sector	4.6
Less	Purchases from the transportation and communications sector	1.4
Less	Purchases from the agriculture sector	23.9
Equals	Net agricultural output	84.8

Similarly, the index of nonagricultural material inputs is expressed in 1972 prices by multiplying it by the 1972 value of such purchases, 18.3 billion rubles. This value can be derived from the 1972 input-output table as the sum of all purchases from the nonagricultural sectors. Subtracting the material-input series from the net output series produces an estimate of value added in agriculture in 1972 rubles which can then be converted to index form.

In the general discussion about the problems of measuring the real growth of value added, it was indicated that use of a gross output index may be preferable to the double deflation method unless the difference between the annual growth rates of gross output and the material inputs is 2 percentage points or more. Table B-8 shows the annual growth rates of gross output, total material inputs, and value added for agriculture. It is clear that frequently there is a large gap between the growth rates; therefore, the double deflation procedure described here is preferable for this sector.

Table B-8 Annual Percentage Rates of Growth

Gross Output, Total Material Purchases, and Value Added in Agriculture

Year	(1) Gross Output	(2) Total Material Inputs	(3) Value Added	(4) Column 1 Less Column 2
1951	−4.9	3.2	−8.0	−8.1
1952	4.4	2.9	5.1	1.6
1953	6.6	7.8	6.0	−1.3
1954	2.8	4.6	2.0	−1.8
1955	12.7	11.5	13.3	1.2
1956	14.6	14.2	14.7	0.4
1957	1.6	8.8	−1.5	−7.2
1958	8.2	7.9	8.4	0.3
1959	1.7	0.9	2.1	0.8
1960	−0.3	3.2	−2.0	−3.5
1961	6.3	5.1	6.9	1.1
1962	−0.3	5.4	−3.0	−5.7
1963	−15.1	−4.3	−20.8	−10.9
1964	21.7	4.9	32.1	16.7
1965	5.4	4.7	5.8	0.8
1966	6.7	12.4	4.0	−5.7
1967	0	2.9	−1.6	−2.9
1968	5.3	3.5	6.3	1.8
1969	−1.2	4.6	−4.4	−5.8
1970	11.5	6.7	14.4	4.9
1971	−0.3	2.2	−1.7	−2.5
1972	−5.0	1.2	−8.5	−6.2
1973	15.5	13.6	16.7	1.9
1974	−2.2	−2.3	−2.2	0.1
1975	−7.3	2.2	−13.3	−9.6
1976	8.4	4.4	11.4	4.1
1977	3.3	3.0	3.5	0.3
1978	4.3	5.5	3.5	−1.2
1979	−4.8	0.3	−8.3	−5.1
1980	−5.2	−2.4	−7.3	−2.8

Sources: Column 1: The gross output of agriculture is computed as the sum of the gross outputs of the livestock and crops sectors. The gross output of the livestock sector is published in JEC, *Agriculture* (table A-1). The gross output of the crops sector is equal to net crops output (ibid) plus the value of seed and waste (unpublished estimates).

Column 2: Total material inputs are computed as the sum of non-agricultural material purchases (table B-7, column 4) and agricultural material purchases. The latter (unpublished) is calculated as gross output less net output.

Column 3: This was computed from table B-7, column 6.

Column 4: This is column 1 less column 2.

Transportation

Scope and Coverage

The transportation sector includes enterprises engaged in the transportation of freight, passengers, and associated activities by rail, sea, inland water, automobile, air, oil and gas pipeline, urban electric transit, timber rafting, tug service, loading and unloading services, and maintenance of highways (*Ukazaniya*, pp. 742-745).

Our index is a composite of 16 physical series of various types of freight and passenger transportation, aggregated with 1970 revenue weights. The procedure is similar to that used by N. M. Kaplan, *Soviet Transport and Communications Output Indexes, 1928-62*, Research Memorandum 4264-PR and Supplement, Santa Monica, Calif., the Rand Corporation, 1964 and 1965. Comparable results for 1950-63 given by Kaplan and the index derived here are nearly identical. The approach is also comparable to that taken by Kendrick to obtain an output index for transportation as part of an investigation of longrun productivity trends in the United States (John W. Kendrick, *Postwar Productivity Trends in the United States*, New York, National Bureau of Economic Research, 1973, pp. 186-193). The US GNP accounts also use a gross output index, but one which is primarily deflated current-price data.

The coverage of the index is incomplete. Omitted entirely are timber rafting, road maintenance, tug service, and activities of independent enterprises engaged in loading and unloading; employment in such omitted activities is estimated to have been about 10 percent of total transport employment in 1970.

A special problem arises with respect to freight hauled by trucks. Two physical series are published in the *Narkhoz*. One relates to common carriers only and the other to total truck haulage in the economy. Most of the trucking activity done by nontransport enterprises is believed to be short-haul work in connection with the current operations of the parent enterprise. This type of activity is considered part of the sectors to which the parent enterprise belongs in the US accounts and, therefore, the physical series relating to common carriers only is used here. This results in a lower weight for the truck index, but a higher growth rate.

Total transportation revenue is calculated as the sum of freight and passenger revenue. Freight revenue is calculated as the sum of the revenue estimated for each of seven modes—rail, sea, inland water, truck, oil pipeline, air, and gas pipeline. The revenue for each mode is calculated as the product of a physical measure and a 1970 average revenue value. Passenger revenue is calculated as the sum of the revenue estimated for each of nine modes—rail, sea, inland water, bus, air, tram, trolley bus, subway, and taxi.

The passenger index is virtually the same as the transportation component of the consumption index; its construction is described by Schroeder and Denton (JEC, *Consumption*). The only difference is that business travel expenses are not deducted for the sector-of-origin index.

Weights

The weights used to aggregate the seven freight subindexes are 1970 average revenue rates per ton-kilometer (tkm) (for gas pipelines, average revenue per cubic meter of gas transported). The weights and their sources are as follows:

Mode	Average Rate (kopecks)	Source
Rail	0.400 per ton-kilometer (tkm)	*Transport i svyaz'*, p. 111
Sea	0.263 per tkm	Ibid, p. 151.
Inland water	0.418 per tkm	Ibid, p. 186.
Truck	7.05 per tkm	Ibid, pp. 222, 251.
Oil pipeline	0.123 per tkm	Ibid, p. 203 with 28-percent profit markup added.
Air	15.63 per tkm	See text.
Gas pipeline	0.258 per cubic meter	R. D. Margulov et al. *Razvitiya gazovoy promyshlennosti*, Moscow, Nedra, 1976, p. 11 with a 28-percent profit markup added.

The average air revenue rate in 1970 was obtained by adding an arbitrary profit markup of 25 percent to the estimated 1970 average cost of 12.5 kopecks per tkm. An average cost of 17.7 kopecks per tkm in 1965 is given in N. N. Barkov, ed., *Zheleznedorozhniy transport v sisteme edinoy transportnoy seti USSR*, Moscow, Transport, 1967, p. 51. The average cost for 1965 was extrapolated forward to 1970 using the average rate of decrease of 7 percent per year calculated from data for 1958-68 published in *Flight International*, 25 September 1969, p. 485.

Description of the Index

The physical data for freight transportation are shown in table B-9. The resulting values for gross revenue of freight, passenger, and total transportation are shown in table B-10 in ruble and index format. The sources for the freight transportation data are as follows.

Mode	Physical Measure	Sources
Rail, inland water, sea, air, and oil pipeline	Ton-kilometers	*Transport i svyaz'*, p. 17, and similar tables in *Narkhozy* for subsequent years.
Truck	Ton-kilometers	Ibid, p. 222, and similar tables in *Narkhozy* for subsequent years.
Gas pipeline	Cubic meters	Ibid, p. 204, and similar tables in *Narkhozy* for subsequent years.

Ideally, the physical series for gas pipelines should take account of the increasing average distance that gas is transported as a result of the exploitation of Siberian fields. Unfortunately, we do not have sufficient data to estimate changes in the average distance transported. Hence, no adjustment is made to the gas pipeline index.

Communications

The index used for the communications sector is identical to that used for the communications component of the consumption index. The methodology and data used are described by Schroeder and Denton in JEC, *Consumption*.

Trade

Scope and Coverage

The trade sector in Soviet statistics encompasses a range of activity roughly equivalent to the wholesale and retail trade sectors in the US classification. Included are: retail trade, public dining, foreign trade, film rentals, material-technical supply (concerned with supplying production enterprises and farms), wholesale trade (concerned with supplying consumer goods to retail trade outlets), and agricultural procurement (concerned with state purchasing of farm products from producers). For a more detailed description, see *Ukazaniya*, pp. 748-751.

The index of value added in the trade sector is based on the assumption that value added is correlated with the volume of goods processed by the trade sector. The trade sector is divided into three major branches (retail trade, wholesale trade which includes material-technical supply, and agricultural procurement), and an index is computed of the value in 1970 prices of goods processed by each branch. The trade index is a weighted average of the three branch indexes. The weights are the value added of each branch in 1970.

The coverage of the trade index is nearly complete. There is no explicit measurement of the activity associated with foreign trade, but much of this activity is probably captured in the retail and wholesale trade indexes. Film rentals are not included, but the value added associated with them is tiny. The retail trade index implicitly includes the activities of public dining enterprises.

An alternative procedure, used in the US accounts, is to deflate the current-price value of sales in the various trade channels. It is not employed here because of the lack of reliable price deflators.

Table B-9

Data Relating to the Activity of Various Modes of Freight Transportation

Year	(1) Rail (billion tkm)	(2) Sea (billion tkm)	(3) Inland Water (billion tkm)	(4) Oil Pipeline (billion tkm)	(5) Truck (billion tkm)	(6) Air (billion tkm)	(7) Gas Pipeline (billion cubic meters)
1950	602.3	39.7	46.2	4.9	0.9	0.14	1.5
1951	677.3	40.3	51.9	5.5	1.1	0.18	1.8
1952	741.3	44.3	58.2	6.4	1.2	0.20	2.1
1953	798.0	48.2	59.3	7.6	2.5	0.22	2.5
1954	856.8	56.6	62.8	10.2	4.2	0.24	3.0
1955	970.9	68.9	67.7	14.7	9.3	0.25	3.5
1956	1,079.1	82.4	70.5	20.5	11.9	0.31	6.0
1957	1,212.8	92.7	76.4	26.6	15.0	0.34	10.3
1958	1,302.0	106.3	85.5	33.8	18.4	0.40	17.8
1959	1,429.5	115.7	93.6	41.6	22.2	0.44	23.6
1960	1,504.3	131.5	99.6	51.2	27.2	0.56	32.8
1961	1,566.6	159.1	106.0	60.0	29.3	0.80	45.8
1962	1,646.3	173.4	109.9	74.5	31.7	0.89	60.3
1963	1,749.4	226.3	114.5	90.9	34.1	0.91	80.0
1964	1,854.1	297.6	124.5	112.1	38.7	1.14	97.9
1965	1,950.2	388.8	133.9	146.7	50.2	1.34	112.1
1966	2,016.0	442.8	137.7	165.0	52.2	1.45	128.8
1967	2,160.5	527.1	143.9	183.4	55.8	1.66	143.3
1968	2,274.8	586.8	155.4	215.9	57.5	1.80	155.1
1969	2,367.1	601.3	160.1	244.6	59.7	1.95	166.0
1970	2,494.7	656.1	174.0	281.7	64.2	1.88	181.5
1971	2,637.3	696.0	183.8	328.5	68.9	1.98	209.8
1972	2,766.8	698.4	180.3	375.9	73.6	2.19	219.9
1973	2,958.0	750.7	189.5	439.4	80.9	2.37	231.1
1974	3,097.7	778.1	212.3	533.4	89.2	2.49	245.7
1975	3,236.5	736.3	221.7	665.9	96.9	2.59	279.4
1976	3,295.4	762.2	222.7	794.6	102.6	2.71	309.5
1977	3,330.9	772.6	230.7	922.4	109.3	2.80	334.6
1978	3,429.4	827.6	243.7	1,049.1	115.8	2.86	351.1
1979	3,349.3	851.1	232.7	1,140.7	123.0	2.91	378.0
1980	3,435.0	848.3	244.7	1,216.0	130.7	3.09	417.7

Sources: See text.

Table B-10

Derivation of the Index of Value Added in Transportation

Year	(1)	(2)	(3)	(4)	(5)	(6)
	Freight Transportation		Personal Transportation		Total Transportation	
	Billion 1970 Rubles	Index (1970 = 100)	Billion 1970 Rubles	Index (1970 = 100)	Billion 1970 Rubles	Index (1970 = 100)
1950	2.8	15.5	1.2	15.3	4.0	15.5
1951	3.1	17.4	1.3	17.1	4.5	17.3
1952	3.5	19.1	1.5	18.7	4.9	19.0
1953	3.8	21.0	1.6	20.9	5.4	21.0
1954	4.2	23.2	1.8	23.2	6.0	23.2
1955	5.1	28.1	2.0	26.4	7.1	27.6
1956	5.8	31.9	2.2	27.8	7.9	30.7
1957	6.6	36.4	2.4	31.3	9.0	34.9
1958	7.3	40.4	2.7	34.4	10.0	38.6
1959	8.2	45.2	2.9	37.5	11.1	42.9
1960	8.9	49.4	3.2	41.4	12.1	47.0
1961	9.5	52.6	3.5	45.2	13.0	50.4
1962	10.1	56.0	3.9	50.7	14.0	54.4
1963	10.9	60.5	4.3	55.4	15.2	59.0
1964	12.0	66.5	4.6	59.6	16.6	64.4
1965	13.6	75.3	5.0	64.9	18.6	72.2
1966	14.2	78.8	5.6	72.2	19.8	76.9
1967	15.4	85.3	6.1	79.4	21.6	83.6
1968	16.3	90.2	6.7	87.3	23.0	89.3
1969	17.0	93.9	7.2	93.7	24.2	93.8
1970	18.1	100.0	7.7	100.0	25.8	100.0
1971	19.3	106.6	8.3	107.0	27.5	106.7
1972	20.2	111.8	8.9	114.5	29.1	112.6
1973	21.8	120.7	9.3	120.6	31.1	120.7
1974	23.3	128.9	10.0	129.7	33.3	129.2
1975	24.6	136.1	10.8	139.3	35.4	137.0
1976	25.5	141.4	11.4	146.8	36.9	143.0
1977	26.5	146.5	11.3	145.6	37.7	146.2
1978	27.7	153.4	11.7	151.8	39.5	152.9
1979	28.1	155.6	12.3	158.5	40.4	156.5
1980	29.2	161.8	12.7	164.2	41.9	162.5

Sources: Column 1: For each year, the physical value in each column in table B-9 is multiplied by the average revenue rate given in the text and the results are summed. The physical values and the average revenue weights are given in JEC, *Consumption*.

Column 2: This is an index of column 1.

Column 3: The same procedure is followed as for column 1.

Column 4: This is an index of column 3.

Column 5: This is column 1 plus column 3.

Column 6: This is an index of column 5.

Weights

Value added in the trade sector in 1970 is derived in appendix D, at 18.273 billion rubles. The value added in each of the three branches of the trade sector is shown in the following tabulation:

Distribution of the Value Added in the Trade Sector, 1970

Billion Rubles

	Total Trade	Retail Trade	Wholesale Trade	Agricultural Procurement
Total value added	**18.273**	11.263	4.826	2.184
Wage bill	**8.748**	6.436	1.646	0.666
Other and imputed income	**0.932**	0.686	0.175	0.071
Social insurance	**0.395**	0.291	0.074	0.030
Depreciation	**1.323**	0.574	0.531	0.218
Profits	**6.679**	3.359	2.208	1.112
Subsidies	**−0.530**	−0.530	0	0
Miscellaneous charges	**0.726**	0.447	0.192	0.087
Percent	**100.0**	61.64	26.41	11.95

The sources for each line item are:

Total Value Added. This is derived as the sum of the components.

Wage Bill. The total wage bill, 8.748 billion rubles, is divided among the branches using employment data for the USSR and wage data for Estonia. Average wages and employment in Estonia for 1970 for three branches (retail trade, wholesale trade, and public dining; material-technical supply; and agricultural procurement) are given in *Narodnoe khozyaystvo Estonskoy SSR v 1972 godu*, Tallin, Eesti Raamat, 1973, pp. 219 and 223. These data plus the implied average monthly wage rate for the total trade sector are shown in the tabulation below. Also shown is the ratio of the monthly wages in each of the three branches to the monthly wage rate for the entire trade sector:

	(1) Employment in Estonia (thousands)	(2) Monthly Wages in Estonia (rubles)	(3) Ratio of Monthly Wages to Average (percent)
Total trade sector	54.2	105.9	100.0
Trade (wholesale and retail) and public dining	46.1	103.5	97.7
Material-technical supply	6.0	121.5	114.7
Agricultural procurement	2.1	113.9	107.6

It is assumed that the structure of relative monthly wages was the same for the USSR as it was for Estonia. The first column in the tabulation below shows the average monthly wage rates implied by this assumption. They are calculated by multiplying the data in column 3 of the tabulation above by the average monthly wage for the total trade sector for the USSR of 95.1 rubles (*Narkhoz 1979*, p. 395). Employment in each branch is shown in column 2. Total trade and retail trade employment are given in *Narkhoz 1973*, pp. 575 and 671. Agricultural procurement employment is given in P. I. Vakhrin, *Formirovaniye osnovnykh fondov kooperativnoy torgovli*, Moscow, Ekonomika, 1974, p. 14. Wholesale trade and material-technical supply employment are derived as a residual. The annual wage bill implied for each branch by the average monthly wage rates and employment is shown in column 3. Finally, these data are scaled up in column 4 so that the total wages equal 8.748 billion rubles.

	(1) Monthly Wages (rubles)	(2) Employment (million persons)	(3) Annual Wage Bill (billion rubles)	(4) Adjusted Wage Bill (billion rubles)
Total trade sector	95.1	7.537	NA	8.748
Retail trade and public dining	92.9	5.746	6.406	6.436
Wholesale trade and material-technical supply	109.1	1.251	1.638	1.646
Agricultural procurement	102.3	0.540	0.663	0.666

Other and Imputed Income. The total, 0.932 billion rubles, was distributed among the branches on the basis of their shares of the wage bill.

Social Insurance. The total, 0.395 billion rubles, was distributed among the branches on the basis of their shares of the wage bill.

Depreciation. Total depreciation in trade was distributed among the branches on the basis of their relative shares in total amortization deductions as given in *Narkhoz 1972*, p. 723. The allocation between retail and wholesale trade was made by estimating amortization deductions for wholesale trade and subtracting the result from the amount given for the two branches combined. The estimate for wholesale trade was made by assuming that the ratio of amortization to wages in that branch was the same as in material-technical supply.

Profits. Total profits in the branches of trade are given in *Narkhoz 1973*, pp. 763 and 767. Since the 1970 value-added component for profits represents net profits (CIA, *GNP 1970*, p. 67), the component representing state enterprise profits (5.396 billion rubles) was distributed among the branches on the basis of their shares in total profits of state enterprises. Net profits equal total profits less the bonuses paid from profits which are also included in wages. Net profits of consumer cooperatives were included with retail trade and public dining.

Subsidies. This item applies only to retail trade. It represents budget reimbursement for losses incurred in sales of slow-moving goods to the population at reduced prices (0.400 billion rubles) and a subsidy on the procurement of fresh vegetables by retail trade (0.130 billion rubles).

Description of the Index

Retail Trade. The value of total goods flowing through the state and cooperative retail trade network in 1970 prices is derived by deducting the value of collective-farm-market and commission sales and the value of household consumption in kind from our index of personal consumption of food expressed in ruble terms, and then adding ruble estimates of the consumption of soft goods and durables. The resulting series measures household purchases of goods in state and cooperative trade in real terms.

Estimates of collective-farm-market sales and household consumption in kind first were derived for the benchmark years of 1950, 1955, 1960, 1966, 1970, 1974, and 1976 as shown in tables B-11 and B-12. The procedure is similar to that used in CIA, *GNP 1970*. First, physical quantities of seven products sold on collective farm markets and nine products consumed in kind by households were estimated for each benchmark year. In general, gross output is divided into the amounts used in production, marketed output, and, as a residual, farm household consumption in kind. Collective-farm-market sales are then estimated as marketed output less state procurement, decentralized procurement, and the difference, if any, between the physical and accounting weight of procurements. Some of the major sources and procedures are indicated in the sources to tables B-11 and B-12. Greater detail is given in CIA, *GNP 1970*, table A-1, pp. 27-31. The quantities of each product for each

Table B-11

Valuation of Farm Household Consumption in Kind in 1970 Prices

	Price (rubles per ton)	1950	1955	1960	1966	1970	1974	1976
Grain	103							
Thousand tons		15,000	16,000	10,000	6,000	3,000	3,000	3,000
Billion rubles		1.545	1.648	1.030	0.618	0.309	0.309	0.309
Potatoes	114							
Thousand tons		30,000	15,000	16,500	18,600	21,843	17,000	13,932
Billion rubles		3.420	1.710	1.881	2.120	2.490	1.938	1.588
Vegetables	163							
Thousand tons		3,175	4,380	5,259	3,686	3,170	2,951	1,606
Billion rubles		0.518	0.714	0.857	0.601	0.517	0.481	0.262
Meat: slaughter weight								
Thousand tons		2,400	2,700	2,700	3,000	2,878	2,820	2,500
Meat	2,327							
Thousand tons		1,956	2,187	2,195	2,403	2,328	2,233	2,043
Billion rubles		4.552	5.089	5.108	5.592	5.418	5.197	4.753
Animal fat	1,900							
Thousand tons		365	445	435	519	469	491	382
Billion rubles		0.693	0.846	0.826	0.986	0.891	0.932	0.727
Milk for home produced butter								
Thousand tons		2,599	2,599	2,509	2,509	2,350	2,260	2,102
Milk	196							
Thousand tons		16,701	17,701	22,109	21,783	21,166	20,300	17,656
Billion rubles		3.273	3.469	4.333	4.270	4.148	3.979	3.461
Butter	3,450							
Thousand tons		115	115	111	111	104	100	93
Billion rubles		0.397	0.397	0.383	0.383	0.359	0.345	0.321
Eggs	100[a]							
Million		7,755	11,424	15,890	15,335	16,793	18,606	17,169
Billion rubles		0.775	1.142	1.589	1.533	1.679	1.861	1.717

Table B-11 (continued)

	Price (rubles per ton)	1950	1955	1960	1966	1970	1974	1976
Fruit	282							
Thousand tons		1,100	1,000	1,000	1,500	2,000	2,000	2,500
Billion rubles		0.310	0.282	0.282	0.423	0.564	0.564	0.705
Total (billion rubles)		**15.483**	**15.298**	**16.290**	**16.526**	**16.376**	**15.606**	**13.842**

[a] The price of eggs is 100 rubles per thousand eggs.

Sources for this table:

Grain. The quantities are estimated by the general methodology given in CIA, *GNP 1970*, p. 31. The 1974 and 1976 values are arbitrarily set equal to the 1970 value. The price is given in CIA, *GNP 1970*, p. 32.

Potatoes. The quantities are derived as gross output less the amounts used for seed and marketed output. Gross output and marketed output are given in *Narkhoz 1974*, pp. 316 and 369, and similar tables in other issues. Seeding rates are derived separately for each year at 19 centners per hectare in 1950, 1955, and 1960; 20 centners per hectare in 1966 and 1974; and 25 centners per hectare in 1970. The price is given in CIA *GNP 1970*, p. 32.

Vegetables. The quantities are derived in the same manner as potatoes. Twenty percent of the gross output is assumed to be fed to livestock. The price is from CIA, *GNP 1970*, p. 32.

Meat. The slaughter weight of meat is derived in detail as described in CIA, *GNP 1970*, table A-3, p. 38. The slaughter weight is then divided into the quantities consumed as meat or animal fat. The percentages of the slaughter weight used for each year are:

	Meat	Animal Fat
1950	81.5	15.2
1955	81.0	16.5
1960	81.3	16.1
1966	80.1	17.3
1970	80.9	16.3
1974	79.2	17.4
1976	81.7	15.3

The detailed derivation of these shares and the prices (not presented here) is based on estimates of the quantities and prices of several types of meat. See CIA, *GNP 1970*, pp. 27-38, for the general procedure used.

Milk. The quantities of total milk are derived in the same manner as potatoes. Milk consumed is equal to total milk less the quantity used for butter, calculated at 22.6 tons of milk per ton of butter. The quantities of butter for 1960, 1970, 1974, and 1976 are given in *Narkhoz 1974*, p. 187, and similar tables in other issues. The quantities for 1950 and 1955 are assumed to be equal to the value published for 1953, and the quantity for 1966 is assumed to be equal to the value published for 1965. The price for milk is from CIA, *GNP 1970*, p. 34. Thirteen percent of the gross output is assumed to be used in production.

Eggs. The quantities are derived in the same manner as potatoes. The number of hatching eggs are calculated as described in CIA, *GNP 1970*, p. 29. The price is given in CIA, *GNP 1970*, p. 35.

Fruit. The quantities consumed in kind are estimated to be 40 percent of the gross output in 1950, 30 percent in 1955, 20 percent in 1960, 19 percent in 1966, 17 percent in 1970, and 16 percent in 1974.

Table B-12

Valuation of Collective Farm Ex-Village Market and Commission Sales in 1970 Prices

	Price (rubles per ton)	1950	1955	1960	1966	1970	1974	1976
Grain	248							
Thousand tons		3,290	2,330	2,270	2,100	2,004	1,500	1,500
Billion rubles		0.816	0.578	0.563	0.521	0.497	0.372	0.372
Potatoes	179							
Thousand tons		6,460	6,530	5,690	5,610	6,002	5,910	5,960
Billion rubles		1.156	1.169	1.019	1.004	1.074	1.058	1.067
Vegetables	381							
Thousand tons		1,560	1,940	1,580	1,460	1,781	1,790	1,138
Billion rubles		0.594	0.739	0.602	0.556	0.679	0.682	0.434
Meat: slaughter weight								
Thousand tons		793	776	686	894	1,093	900	1,060
Meat	2,378							
Thousand tons		646	629	558	716	884	713	866
Billion rubles		1.537	1.495	1.326	1.703	2.103	1.695	2.059
Animal fat	1,900							
Thousand tons		121	128	110	155	178	157	162
Billion rubles		0.229	0.243	0.210	0.294	0.339	0.298	0.308
Milk	316							
Thousand tons		2,420	2,860	1,860	1,360	1,048	910	958
Billion rubles		0.765	0.904	0.588	0.430	0.331	0.288	0.303
Eggs	126 [a]							
Million		1,370	3,140	3,170	2,780	2,522	2,130	1,963
Billion rubles		0.173	0.396	0.399	0.350	0.318	0.268	0.247
Total (billion rubles)		**5.270**	**5.523**	**4.707**	**4.858**	**5.340**	**4.660**	**4.790**

[a] The price of eggs is 126 rubles per thousand eggs.

Sources: The quantities for 1950, 1955, and 1960 are taken from Jerzy F. Karcz, "Quantitative Analysis of the Collective Farm Market," *American Economic Review* 54, June 1964, unpublished appendix. The quantities for 1966 are derived by extending the Karcz series by means of commodity indexes for collective-farm-market sales presented in *Narkhoz 1968*, p. 654. The quantities for 1970, 1974, and 1976 are calculated as in CIA, *GNP 1970*—that is, marketed output less all procurements and the difference, if any, between the physical and accounting weight of procurements. The prices are from CIA, *GNP 1970*, pp. 32-35.

benchmark year are then multiplied by 1970 prices and summed to obtain total ruble values for collective-farm-market and commission sales and for household consumption in kind.

Ruble values for collective-farm-market sales and household consumption in kind for all other years were obtained by interpolation. The ruble values for both consumption categories in each benchmark year were expressed as percentages of the total consumption of food. The percentages between each benchmark year were interpolated based on equal percentage rates of change. The interpolated percentages were then multiplied by the total consumption of food to obtain ruble values. These calculations and the resulting retail trade index are shown in table B-13.

Wholesale Trade. The wholesale trade network serves as an intermediary between industrial enterprises and retail trade enterprises. The material-technical supply system serves as an intermediary between state production enterprises. The index used to measure both types of activity is a weighted average of nine gross output indexes of branches of industry. All branches except for electric power and "other industry" are included. The industrial production indexes are described by Ray Converse in JEC, *Industry*. The derivation of the wholesale trade index is shown in table B-14. The 1970 gross outputs of the nine branches were computed in producers' prices as part of the factor-cost adjustment described in appendix E and are shown in the following tabulation:

Estimated Gross Outputs of Selected
Branches of Industry, 1970
(Producers' Prices)

	Billion Rubles	Percent
Total	363.618	100.00
Ferrous metals	24.702	6.79
Nonferrous metals	12.374	3.40
Fuels	22.442	6.17
Machinery	92.800	25.52
Chemicals	22.414	6.16
Wood, pulp, and paper	19.419	5.34
Construction materials	15.990	4.40
Light industry	62.988	17.32
Food industry	90.489	24.89

Agricultural Procurement. The value of 16 agricultural products purchased from state and collective farms and from private individuals for use by state production enterprises or retail trade outlets forms our index of agricultural procurement activity. The data exclude decentralized procurement, which in 1970 amounted to only about 4 percent of the value of all state procurement.

The physical series are aggregated with 1970 average procurement prices. The average prices for eight products—grain, potatoes, vegetables, sunflower seeds, meat, milk, wool, and eggs—were calculated directly from data on quantities and prices for the three procurement channels (state farms, collective farms, and individuals) given in CIA, *GNP 1970*, pp. 32-35. Average procurement prices for the remaining products were obtained as explained and documented in JEC, *Agriculture*. The derivation of the percentage weights to combine the 16 products is shown in table B-15 and the physical quantities in table B-16. The resulting index is shown in table B-17.

The Total Trade Index

The three branch indexes are combined using the weights developed above. The branch indexes and the resulting total trade index are shown in table B-17.

Services

The end-use housing, utilities, repair and personal care, recreation, education, and health indexes are described by Schroeder and Denton in JEC, *Consumption*. Only the differences from those indexes and the remaining service indexes are described here. The end-use utilities index is a weighted average of the housing stock and household consumption of electricity and natural gas. The sector-of-origin utilities index does not include an electricity component because the activity of the urban electric power network is believed to be included with the electric power branch of industry. The natural gas component is measured by total production rather than personal consumption in order to reflect the fact that the

Table B-13

Derivation of [illegible] etail Trade Index

Year	(1) Consumption of Food (billion 1970 rubles)	(2) Income in Kind	(3)	(4) Collective Farm Sales	(5)	(6) Retail Trade Sales	(7)	(8)	(9)	(10)
		Percent of (1)	Billion 1970 Rubles	Percent of (1)	Billion 1970 Rubles	Food (billion 1970 rubles)	Soft Goods (billion 1970 rubles)	Durables (billion 1970 rubles)	Total (billion 1970 rubles)	Index (1970 = 100)
1950	42.7	36.3	15.5	12.4	5.3	21.9	10.8	1.5	34.3	23.7
1951	42.1	34.4	14.5	11.9	5.0	22.6	12.3	1.8	36.7	25.3
1952	45.7	32.6	14.9	11.4	5.2	25.6	13.0	2.1	40.6	28.1
1953	49.6	31.0	15.3	10.9	5.4	28.8	14.4	2.7	45.9	31.7
1954	51.2	29.4	15.0	10.5	5.4	30.8	16.7	3.4	51.0	35.2
1955	54.9	27.9	15.3	10.1	5.5	34.1	17.6	3.7	55.5	38.3
1956	57.3	26.8	15.4	9.3	5.3	36.6	19.1	4.1	59.9	41.4
1957	61.9	25.8	16.0	8.5	5.3	40.6	20.4	5.0	66.0	45.6
1958	66.2	24.9	16.5	7.9	5.2	44.5	22.0	5.5	71.9	49.7
1959	67.8	23.9	16.2	7.2	4.9	46.7	23.3	6.0	76.0	52.5
1960	70.6	23.1	16.3	6.7	4.7	49.6	25.2	6.7	81.6	56.4
1961	72.3	22.3	16.1	6.5	4.7	51.5	26.1	6.9	84.4	58.3
1962	75.4	21.6	16.3	6.3	4.7	54.4	27.0	7.2	88.6	61.2
1963	79.4	20.9	16.6	6.1	4.8	58.0	27.1	7.2	92.2	63.7
1964	79.3	20.2	16.0	5.9	4.7	58.6	28.0	7.9	94.4	65.2
1965	83.3	19.6	16.3	5.7	4.8	62.2	29.9	8.8	100.8	69.6
1966	87.2	18.9	16.5	5.6	4.9	65.9	32.5	9.8	108.2	74.7
1967	92.6	17.9	16.6	5.4	5.0	71.0	35.4	10.7	117.1	80.9
1968	98.1	17.0	16.6	5.2	5.2	76.4	38.5	11.8	126.7	87.5
1969	103.9	16.0	16.7	5.1	5.3	81.9	41.4	12.8	136.1	94.0
1970	107.9	15.2	16.4	4.9	5.3	86.2	44.3	14.3	144.8	100.0
1971	110.3	14.6	16.2	4.7	5.2	89.0	46.4	16.2	151.6	104.7

Table B-13 (Continued)

Derivation of the Retail Trade Index

Year	(1) Consumption of Food (billion 1970 rubles)	(2) Income in Kind	(3)	(4) Collective Farm Sales	(5)	(6) Retail Trade Sales	(7)	(8)	(9)	(10)
		Percent of (1)	Billion 1970 Rubles	Percent of (1)	Billion 1970 Rubles	Food (billion 1970 rubles)	Soft Goods (billion 1970 rubles)	Durables (billion 1970 rubles)	Total (billion 1970 rubles)	Index (1970 = 100)
1972	110.4	14.1	15.6	4.4	4.9	89.9	47.7	18.7	156.3	108.0
1973	114.0	13.6	15.5	4.2	4.7	93.8	49.3	20.3	163.3	112.8
1974	118.7	13.1	15.6	3.9	4.7	98.5	51.0	22.0	171.4	118.4
1975	122.6	12.5	15.3	3.8	4.6	102.6	53.8	24.1	180.5	124.7
1976	123.6	11.2	13.8	3.9	4.8	105.0	56.3	25.7	187.0	129.2
1977	126.2	11.0	13.8	3.8	4.8	107.6	58.2	28.0	193.9	133.9
1978	129.9	10.7	13.9	3.7	4.8	111.2	59.9	29.2	200.3	138.4
1979	133.0	10.5	13.9	3.6	4.8	114.3	62.4	30.4	207.2	143.1
1980	134.4	10.2	13.7	3.5	4.7	116.0	65.4	32.5	213.9	147.8

Sources: Column 1: The consumption of food in 1970 established prices is computed by multiplying the index of consumption of food by the 1970 value of 107.9 billion rubles (table 9). The food index is derived in JEC, *Consumption*.

Columns 2 and 4: The values for 1950, 1955, 1960, 1966, 1970, 1974, and 1976 are derived by dividing columns 3 and 5, respectively, by column 1. Intervening years are interpolated by assuming equal percentage rates of change.The values for 1977-80 are assumed to decrease at an annual rate of 0.25 percentage points for income in kind (column 2), and 0.1 percentage points for collective-farm-market sales (column 4).

Columns 3 and 5: The values for 1950, 1955, 1960, 1966, 1970, 1974, and 1976 are from tables B-11 and B-12. The values for all other years are derived as column 1 times columns 2 and 4, respectively.

Column 6: This is column 1 less columns 3 and 5.

Columns 7 and 8: The base-year (1970) ruble values of consumption of soft goods and durables are multiplied by our indexes of consumption of soft goods and durables as derived in JEC, *Consumption*. The 1970 values are from table 9.

Column 9: This is the sum of columns 6, 7, and 8.

Column 10: This is the index of column 9.

Table B-14

1970 = 100

Derivation of the Wholesale Trade Index

Year	Ferrous Metals	Non-ferrous Metals	Fuels	Machinery	Chemicals	Wood, Pulp, and Paper	Construction Materials	Light Industry	Food Industry	**Total**
1950	22.6	19.0	24.0	21.6	13.0	40.4	14.2	27.8	22.3	**23.1**
1951	25.6	21.5	26.3	23.7	14.3	45.8	16.1	32.7	25.5	**26.2**
1952	29.1	24.2	28.1	25.8	15.6	47.6	18.2	34.7	27.9	**28.4**
1953	31.9	27.0	30.0	28.1	17.2	49.6	21.2	38.1	30.9	**31.0**
1954	34.8	29.6	33.1	30.6	19.6	54.7	24.7	42.6	33.1	**34.6**
1955	38.3	34.7	37.6	34.2	22.5	57.6	29.4	45.6	36.2	**37.5**
1956	41.2	36.8	41.8	36.7	25.3	59.7	32.6	48.3	40.9	**40.7**
1957	43.7	38.9	46.6	39.2	27.7	63.9	37.9	50.5	43.5	**43.5**
1958	46.6	41.0	50.9	42.1	31.0	69.9	45.2	54.5	46.8	**47.2**
1959	50.7	44.4	54.5	45.9	33.7	76.3	52.0	58.7	51.7	**51.5**
1960	55.1	48.4	57.7	50.1	37.1	76.4	58.3	62.1	54.1	**54.9**
1961	59.8	52.4	60.6	54.3	40.8	76.3	62.6	64.3	58.1	**58.4**
1962	64.4	57.1	64.1	59.8	45.1	78.1	65.8	66.6	61.7	**62.3**
1963	68.4	61.5	69.4	63.7	50.0	81.4	67.6	67.5	64.3	**65.4**
1964	73.4	65.2	73.9	67.7	56.8	85.1	70.9	69.5	67.7	**69.1**
1965	78.1	69.9	78.3	71.5	65.3	86.8	75.8	70.7	75.3	**73.7**
1966	82.9	76.7	83.3	74.7	71.8	87.2	81.2	76.0	78.6	**77.8**
1967	87.6	83.5	87.7	79.7	79.0	91.5	87.0	82.3	84.4	**83.4**
1968	91.6	90.2	90.8	86.9	84.7	93.7	90.4	88.8	89.2	**88.8**
1969	94.8	94.7	94.8	92.9	89.8	95.4	92.2	94.4	94.3	**93.7**
1970	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	**100.0**
1971	103.8	107.0	104.8	108.1	108.1	102.8	106.7	104.5	102.6	**105.2**
1972	107.3	112.7	109.8	115.6	115.3	104.8	112.3	105.3	105.9	**109.6**
1973	111.6	119.6	115.1	125.3	125.7	107.7	119.0	108.2	106.7	**114.8**
1974	116.3	126.9	120.7	136.0	137.7	109.6	124.6	111.1	115.2	**122.1**
1975	121.5	132.9	127.8	146.4	151.0	113.6	130.2	114.3	121.1	**129.1**
1976	124.7	137.1	132.5	154.5	158.3	113.4	134.8	119.0	119.7	**132.9**
1977	125.6	141.3	138.1	163.2	166.6	114.0	137.4	122.1	124.5	**138.0**
1978	128.4	145.9	142.5	172.4	172.5	113.4	140.7	125.2	123.2	**141.7**
1979	128.4	150.2	146.7	182.0	172.9	110.2	141.2	127.4	127.2	**145.8**
1980	128.0	151.4	150.1	190.0	181.9	113.2	142.6	130.0	125.4	**148.8**

Source: See text.

Table B-15

Computation of the Weights for the Agricultural Procurement Index

Product	1970 Average Procurement Price (rubles per ton)	1970 Procurement Volume (thousand tons)	1970 Value of Procurement (billion rubles)	Percentage Share of Procurement Value
Total	NA	NA	**50.341**	**100.0**
Grain	97	73,284	7.109	14.1
Potatoes	74	11,233	0.831	1.7
Vegetables	106	10,918	1.157	2.3
Fruit	282	6,180	1.743	3.5
Meat	1,472	12,595	18.540	36.8
Milk	192	45,681	8.771	17.4
Eggs	94[a]	18,054[b]	1.697	3.4
Wool	4,651	440.9	2.051	4.1
Silk	5,100	33.7	0.172	0.3
Cotton	555	6,890	3.824	7.6
Flax fiber	2,344	431.4	1.011	2.0
Sugar beets	26	71,385	1.856	3.7
Sunflower seeds	180	4,613	0.830	1.6
Tobacco	2,086	228	0.476	0.9
Makhorka	582	30	0.017	[c]
Tea	940	272.7	0.256	0.5

[a] The price of eggs is 100 rubles per thousand eggs.
[b] Million eggs.
[c] Less than 0.05 percent.

Sources: Column 1: See text.
Column 2: See table B-16.
Column 3: This is column 1 times column 2.
Column 4: This was computed from column 3.

Table B-16

Thousand Tons

Derivation of the Agricultural Procurement Index

Year	Grain	Potatoes	Vegetables	Fruit	Meat	Milk	Eggs (million)	Wool
1950	32,311	6,906	2,043	597	2,277	8,479	1,912	136.0
1951	33,600	5,195	1,819	796	2,719	9,201	2,147	156.0
195.	34,700	5,554	1,803	995	3,161	9,923	2,382	176.0
1953	31,107	5,422	2,485	1,193	3,604	10,646	2,618	197.0
1954	34,600	6,615	2,974	1,267	3,886	12,076	2,752	224.0
1955	36,901	5,869	3,877	1,341	4,168	13,506	2,886	230.0
1956	54,107	9,206	3,783	1,300	4,449	17,337	3,272	246.0
1957	35,411	7,897	4,162	1,700	5,053	20,454	4,284	281.0
1958	56,600	7,049	4,179	1,900	5,661	22,095	4,536	315.0
1959	46,600	6,826	4,500	1,908	7,508	24,957	5,662	354.0
1960	46,736	7,066	5,105	1,951	7,880	26,311	6,452	357.6
1961	52,109	7,000	5,477	2,303	7,334	28,305	7,376	368.8
1962	56,649	5,680	6,242	2,937	8,564	29,215	8,500	374.5
1963	44,822	8,024	6,347	3,061	9,339	28,541	8,677	380.0
1964	68,275	11,113	7,891	3,415	8,255	31,397	8,296	352.7
1965	36,331	9,946	7,724	4,477	9,280	38,700	10,478	368.5
1966	74,984	9,341	7,954	4,473	10,270	40,069	11,561	380.0
1967	57,234	11,680	9,469	4,680	11,533	42,457	12,890	410.0
1968	69,047	11,724	9,099	6,004	11,927	43,996	14,061	428.8
1969	55,540	10,628	9,638	5,817	11,724	43,782	15,444	401.7
1970	73,284	11,233	10,918	6,180	12,595	45,681	18,054	440.9
1971	64,119	11,482	11,467	6,351	14,163	47,078	21,570	457.4
1972	59,971	11,087	11,234	5,325	15,023	48,443	24,299	451.6
1973	90,529	15,410	14,126	7,793	14,695	52,978	27,544	470.1
1974	73,285	11,156	14,657	7,933	16,187	55,768	30,892	506.8
1975	50,213	14,527	13,883	8,541	16,756	56,296	33,065	510.9
1976	92,127	13,435	16,022	9,684	15,108	56,220	32,897	480.5
1977	68,027	17,122	16,171	9,439	16,286	60,762	36,831	512.1
1978	95,900	14,951	18,374	9,268	17,034	60,368	39,288	528.2
1979	62,834	16,400	18,010	10,827	16,692	58,954	41,050	538.3
1980	69,400	11,100	17,700	10,003	15,900	57,300	43,100	523.0

Table B-16 (Continued)

Thousand Tons

Year	Silk	Cotton	Flax Fiber	Sugar Beets	Sunflower Seeds	Tobacco	Makhorka	Tea
1950	24.8	3,539	174.0	19,705	1,084	59	86	84.9
1951	25.2	3,727	159.0	23,377	1,156	66	85	94.9
1952	25.6	3,780	189.0	21,991	1,346	73	83	97.7
1953	25.9	3,853	145.0	22,891	1,796	81	82	110.0
1954	26.5	4,200	192.0	19,523	1,188	93	68	110.2
1955	24.4	3,881	347.0	30,664	2,316	81	108	121.0
1956	28.1	4,332	427.0	31,457	2,391	79	119	110.0
1957	23.9	4,211	387.0	38,535	1,760	102	88	112.4
1958	28.3	4,340	392.0	51,023	2,615	100	102	138.2
1959	29.6	4,645	333.0	41,369	1,861	112	71	145.7
1960	29.7	4,289	369.0	52,198	2,293	103	70	163.7
1961	28.9	4,518	368.8	47,742	2,923	100	33	161.6
1962	30.6	4,304	394.8	43,946	3,082	102	30	178.9
1963	33.9	5,210	368.5	44,455	3,035	122	28	195.6
1964	33.3	5,285	316.8	76,124	3,933	184	43	193.7
1965	34.8	5,662	432.6	67,500	3,888	169	43	197.0
1966	34.7	5,981	426.3	69,715	4,663	178	38	238.2
1967	36.9	5,970	446.9	81,579	4,867	215	32	234.4
1968	36.1	5,945	355.5	84,168	4,906	215	46	229.0
1969	35.7	5,708	447.2	65,283	4,312	195	39	244.6
1970	33.7	6,890	431.4	71,385	4,613	228	30	272.7
1971	36.7	7,101	461.3	64,329	4,359	230	24	280.2
1972	41.4	7,296	439.1	68,043	3,753	275	17	291.1
1973	39.9	7,664	420.7	77,799	5,553	273	26	305.4
1974	38.7	8,409	364.1	67,484	5,228	292	18	329.9
1975	39.1	7,864	477.7	61,880	3,841	287	9	352.3
1976	45.1	8,278	482.7	85,142	3,770	299	12	375.4
1977	43.1	8,758	440.4	84,869	4,447	300	7	434.2
1978	46.5	8,500	331.9	80,061	4,028	273	7	453.8
1979	47.0	9,161	296.0	69,300	4,225	295	5	480.0
1980	45.0	9,960	247.0	64,400	3,360	260	4	530.0

Sources: The data for all products are from *Narkhoz 1978*, pp. 203, 224, 229-231, 234-235, and 253-255, and similar tables in *Narkhozy* for other years. Data for fruit, meat, milk, eggs, silk, tobacco, and makhorka for 1951, 1952, and 1954 are interpolated.

Table B-17 1970 = 100

Derivation of the Index of Value Added in Trade

Year	(1) Retail Trade	(2) Wholesale Trade	(3) Agricultural Procurement	(4) Total Trade
1950	23.7	23.1	26.4	23.9
1951	25.3	26.2	28.6	26.0
1952	28.1	28.4	31.0	28.5
1953	31.7	31.0	32.5	31.6
1954	35.2	34.0	35.4	34.9
1955	38.3	37.5	38.8	38.2
1956	41.4	40.7	46.0	41.7
1957	45.6	43.5	45.8	45.1
1958	49.7	47.2	53.9	49.5
1959	52.5	51.5	58.4	52.9
1960	56.4	54.9	60.9	56.5
1961	58.3	58.4	61.8	58.7
1962	61.2	62.3	67.0	62.2
1963	63.7	65.4	68.1	64.7
1964	65.2	69.1	73.4	67.2
1965	69.6	73.7	74.5	71.3
1966	74.7	77.8	86.4	76.9
1967	80.9	83.4	89.8	82.6
1968	87.5	88.8	94.6	88.7
1969	94.0	93.7	90.1	93.5
1970	100.0	100.0	100.0	100.0
1971	104.7	105.2	104.4	104.8
1972	108.0	109.6	106.7	108.3
1973	112.8	114.8	118.3	114.0
1974	118.4	122.1	120.9	119.7
1975	124.7	129.1	118.6	125.1
1976	129.2	132.9	124.3	129.6
1977	133.9	138.0	126.9	134.2
1978	138.4	141.7	133.7	138.7
1979	143.1	145.8	127.5	142.0
1980	147.8	148.8	124.7	145.3

utilities sector supplies all urban customers, not just households. The weights used to combine the two components of the sector-of-origin utilities index are: natural gas, 25.3 percent, and the housing stock, 74.7 percent. The weights used to combine the subindexes of the repair and personal care and recreation indexes are derived by disaggregating the value-added components of these two sectors and, therefore, differ from the end-use weights. The weights used are:

	Percent
Repair and personal care	100.0
State provided services	79.9
Privately provided services	20.1
Recreation	100.0
Entertainment	51.5
Vacation resorts	14.0
L[illegible]	34.4

The education and health sector-of-origin indexes are the man-hour components of the end-use education and health indexes. The following sections describe the remaining services—science, credit and insurance, and government administrative services.

Science

Scope and Coverage. As defined here, science comprises the activities of scientific research organizations subordinate to ministries or the academies of sciences. More specifically, the organizations included are: (1) academies, institutes, observatories, archives, botanical gardens, museums, and libraries engaged in scientific research; (2) surveying and geological exploration of a general nature; (3) independent design organizations and selected experimental stations; (4) hydrometeorological service; and (5) ancillary organizations servicing scientific organizations, such as machine-testing stations (*Ukazaniya*, pp. 757-759). The sector encompasses the Soviet classification category "science and scientific services," for which employment and wage data are regularly reported. The activities are financed partly by the state budget and partly by charges to enterprise costs and profits.

The sector encompasses most but not all Soviet activity in the area of research and development. Some of the scientific research done at higher educational institutions is not included—about 2 percent of total reported outlays according to B. M. Grinchel', *Izmereniye effectivnosti nauchno-tekhnicheskogo* *progressa*, Moscow, Ekonomika, 1974, p. 40. Presumably, the associated employment and earnings are counted in the education sector. Also not included are research and development activities carried out in the laboratories and design organizations of individual producing enterprises (Ibid, pp. 39-40). These expenditures are sizable, but are considered a part of the production activity of each enterprise and are charged to product costs.

Science is treated as a separate producing sector here because employment and wage data are given separately in Soviet statistics. In the US national accounts by sector of origin, employment in comparable activities would be included mainly in the government, services, and manufacturing sectors. There are no data on the basis of which to distribute reported Soviet employment in science among employment categories comparable to US practice.

The science index is a weighted composite of indexes of man-hour employment and material inputs. The inclusion of a materials component in the index is designed to capture some manufacturing type of activity, mainly of prototypes or unique custom-built equipment, that apparently takes place in research institutes under branch ministries.

Weights. The weights of the man-hour employment and material-input indexes are the estimated ruble expenditures for both components in 1970. The weight for the man-hour employment component (5.296 billion rubles) is the sum of wages and social security allowances (table D-7). The weight for the material-input component (4.463 billion rubles) is estimated in table B-18 as a part of the material-input index.

Description of the Index. *Man-Hour Employment.* The man-hour employment data, column 4 of table B-19, are from Stephen Rapawy, *Civilian Employment in the USSR: 1950 to 1978*, Washington, D. C., Department of Commerce, Bureau of the Census, 1980, p. 23 for 1950-78 and extended to 1980 by the same methodology.

Material Inputs. This is a deflated current-price index. The derivation of the series in current prices is shown in table B-18. Data in current prices are available for 1960-72 in Soviet sources. Values for other years are calculated as estimated shares of "outlays on science from the state budget and other sources," which are published in the *Narkhoz*.

The expenditures on material inputs in current prices are converted to 1970 prices by a weighted average of wholesale price indexes for 10 branches of industry (ferrous metallurgy, coal, oil, electric power, machinery, chemicals, wood products, construction materials, light industry, and food industry). The weights to combine the 10 indexes are obtained from the structure of purchases by science and administration in 1970 published by V. M. Rutgayzer, *Resursy razvitiya neproizvodstvenno sfery*, Moscow, Mysl', 1975, p. 168. Science purchases were about 86 percent of this total. All of the price indexes except the one for machinery are the official indexes published in the *Narkhoz* (for example, *Narkhoz 1979*, p. 164). The official index for machinery is believed to understate price increases badly in that branch. Accordingly, an alternative price index estimated by Abraham Becker for 1958-70 ("The Price Level of Soviet Machinery in the 1960s," *Soviet Studies* 26, July 1974, pp. 363-379) was used. Estimates for 1950-57 were obtained by extrapolation on the basis of annual changes given by the official index. Since 1970, a rate of increase of 1 percent annually was assumed, except for 1971 and 1973, when price reductions were assumed to offset the general inflationary pressures from other sources. The resulting aggregate price index and the derivation of the total science index are shown in table B-19.

Credit and Insurance

Scope and Coverage. This sector includes the activities of the state bank (Gosbank), the construction bank (Stroybank), the foreign trade bank, the system of savings banks, and the insurance enterprises (*Ukazaniya*, p. 760).

Table B-18

Derivation of the Index of Material Purchases by Science

Year	(1) Total Material Expenditures of the Nonproductive Sphere (billion rubles)	(2) Material Inputs of Science as a Percent of Total Nonproductive Material Expenditures	(3) Total Science Expenditures (billion rubles)	(4) Material Inputs of Science (billion rubles)	(5) Column 4 as a Percent of Column 3
1950			1.0	0.376	37.6
1951			1.1	0.414	37.6
1952			1.2	0.451	37.6
1953			1.3	0.489	37.6
1954			1.4	0.526	37.6
1955			1.6	0.601	37.6
1956			2.0	0.752	37.6
1957			2.4	0.902	37.6
1958			2.8	1.053	37.6
1959			3.3	1.241	37.6
1960	8.1	18.1	3.9	1.466	37.6
1961	8.5	20.1	4.5	1.708	38.0
1962	9.2	20.9	5.2	1.923	37.0
1963	9.9	21.3	5.8	2.109	36.4
1964	10.7	22.5	6.4	2.407	37.6
1965	11.5	22.6	6.9	2.599	37.7
1966	12.4	23.0	7.5	2.852	38.0
1967	13.4	23.0	8.2	3.082	37.6
1968	14.5	24.0	9.0	3.480	38.7
1969	15.6	24.5	10.0	3.822	38.2
1970	17.3	25.8	11.7	4.463	38.1
1971	18.4	26.5	13.0	4.876	37.5
1972	19.7	27.2	14.4	5.358	37.2
1973			15.7	5.842	37.2
1974			16.5	6.140	37.2
1975			17.4	6.475	37.2
1976			17.7	6.586	37.2
1977			18.3	6.810	37.2
1978			19.3	7.182	37.2
1979			20.2	7.517	37.2
1980			21.5	8.000	37.2

Sources: Column 1: V. M. Rutgayzer, *Resursy razvitiya neproizvodstvennoy sfery*, Moscow, Mysl', 1975, p. 157.

Column 2: Ibid., p. 158.

Column 3: 1950, 1960, and 1965-79 are from *Narkhoz 1975*, p. 744, and similar tables in other issues. 1961-64 are from UNESCO, *Science Policy and Organizations of Research in the USSR*, Paris, UNESCO, 1967, p. 54. 1951-59 are interpolated based partly on growth rates published in *Narkhoz 1959*, p. 805. 1980 is from *Tsifrakh 1980*, p. 81.

Column 4: 1960-72 are column 1 times column 2. 1950-59 and 1973-80 are column 3 times column 5.

Column 5: 1960-72 are column 4 divided by column 3. Values for 1950-59 are assumed to be equal to the 1960 value. Values for 1973-80 are assumed to be equal to the 1972 value.

Table B-19

Derivation of the Index of Value Added in Science

Year	(1) Material Inputs (billion rubles)	(2) Price Index for Material Inputs of Science (1970 = 100)	(3) Material Inputs (billion 1970 rubles)	(4) Man-Hour Employment (million)	(5) Wage Income (billion 1970 rubles)	(6) Total Science Expenditures (billion 1970 rubles)	(7) Index of Science Expenditures (1970 = 100)
1950	0.376	135.3	0.278	1,538	1.498	1.775	18.2
1951	0.414	116.6	0.355	1,639	1.596	1.951	20.0
1952	0.451	107.9	0.418	1,737	1.691	2.110	21.6
1953	0.489	100.5	0.486	1,774	1.728	2.214	22.7
1954	0.526	97.2	0.541	1,849	1.800	2.342	24.0
1955	0.601	92.3	0.652	1,952	1.901	2.553	26.2
1956	0.752	87.8	0.856	2,088	2.034	2.890	29.6
1957	0.902	86.3	1.045	2,216	2.158	3.203	32.8
1958	1.053	85.0	1.239	2,454	2.390	3.629	37.2
1959	1.241	85.5	1.451	2,644	2.575	4.026	41.3
1960	1.466	87.2	1.681	3,003	2.924	4.605	47.2
1961	1.708	87.8	1.947	3,286	3.200	5.147	52.7
1962	1.923	88.3	2.178	3,634	3.539	5.717	58.6
1963	2.109	89.1	2.366	3,901	3.799	6.166	63.2
1964	2.407	89.9	2.678	4,140	4.032	6.709	68.7
1965	2.599	90.5	2.872	4,311	4.198	7.070	72.4
1966	2.852	91.3	3.125	4,533	4.414	7.539	77.3
1967	3.082	95.3	3.234	4,744	4.620	7.854	80.5
1968	3.480	98.8	3.522	5,005	4.874	8.396	86.0
1969	3.822	99.1	3.856	5,258	5.120	8.976	92.0
1970	4.463	100.0	4.463	5,438	5.296	9.759	100.0
1971	4.876	100.4	4.857	5,709	5.559	10.417	106.7
1972	5.358	100.4	5.339	6,003	5.846	11.184	114.6
1973	5.842	100.5	5.815	6,299	6.134	11.950	122.4
1974	6.140	100.6	6.103	6,542	6.371	12.474	127.8
1975	6.475	101.0	6.413	6,857	6.678	13.091	134.1
1976	6.586	101.7	6.476	6,984	6.802	13.278	136.0
1977	6.810	102.5	6.646	7,166	6.978	13.624	139.6
1978	7.182	103.3	6.950	7,346	7.154	14.104	144.5
1979	7.517	104.2	7.212	7,698	7.497	14.709	150.7
1980	8.000	104.6	7.645	7,908	7.701	15.346	157.2

Sources: Column 1: See table B-18, column 4.
Column 2: See text.
Column 3: This is column 1 deflated by column 2.
Column 4: See text.
Column 5: The 1970 value is from table D-7. All other values are computed by converting column 4 to index form (1970 = 100) and multiplying it by the 1970 value in this column.
Column 6: This is column 3 plus column 5.
Column 7: This is the index of column 6.

Description of the Index. The index is based on man-hour employment, which probably understates growth since the accounting operations that form a large part of this sector's work have been gradually mechanized. The data on employment and man-hours are obtained from Rapawy, *Civilian Employment*, pp. 2 and 14 for 1950-78 and extended to 1980 by the same methodology. These data and the resulting index are shown in table B-20.

Government Administrative Services

Scope and Coverage. These services represent activities that are usually financed and treated statistically as part of the government (nondefense) sector in the national accounts of Western countries. Soviet statistical practice in the treatment of government types of activities differs from Western practice. Accordingly, to obtain a group of activities for the Soviet Union which are reasonably comparable to the Western concept of general government, several Soviet statistical categories had to be combined and others estimated independently from a variety of information. This procedure is better than using the single Soviet category "*apparat* of organs of state and economic administration, administrative organs of cooperative and social organizations," for which employment and other types of data are reported but which is extremely narrow in scope. The problems of reconciling Soviet and Western concepts and definitions of government and administrative employment are discussed in some detail in Stephen Rapawy, *Comparison of U.S. and U.S.S.R. Civilian Employment in Government: 1950-1969*, Washington, D. C., US Department of Commerce, Bureau of Economic Analysis, 1972, International Population Reports Series P-95, No. 69; and Gertrude E. Schroeder, "A Critique of Official Statistics on Public Administration in the USSR," *ACES Bulletin* 18, Spring 1976, pp. 23-44.

Activities explicitly included in this sector are: general agricultural programs, forestry, state administration and the administrative organs of social organizations, culture, municipal services, and civilian police. Each of these categories is discussed below. The coverage of this group is hard to compare with general government activities in the United States. Major activities known to be excluded are upkeep of highways (included in transportation) and research and development (included in science).

Table B-20

Derivation of the Index of Value Added in Credit and Insurance

Year	(1) Employment (thousands)	(2) Hours Worked (million)	(3) Index (1970 = 100)
1950	264	571	80.8
1951	263	567	80.3
1952	262	563	79.8
1953	263	564	79.9
1954	264	566	80.1
1955	265	567	80.3
1956	266	555	78.6
1957	261	532	75.3
1958	260	526	74.5
1959	260	512	72.4
1960	265	502	71.0
1961	277	502	71.0
1962	283	513	72.6
1963	289	522	74.0
1964	296	538	76.1
1965	300	541	76.6
1966	313	567	80.3
1967	329	598	84.6
1968	346	630	89.2
1969	363	662	93.8
1970	388	706	100.0
1971	411	753	106.6
1972	439	802	113.6
1973	465	844	119.5
1974	493	897	127.0
1975	519	943	133.5
1976	546	992	140.4
1977	574	1,040	147.3
1978	604	1,095	155.0
1979	632	1,146	162.2
1980	650	1,178	166.8

Sources: Column 1: 1950-78 are from Rapawy, *Civilian Employment*, p. 2. 1979 is from *Narkhoz 1979*, p. 388. 1980 is from *Tsifrakh 1980*, p. 161.
Column 2: Rapawy, *Civilian Employment*, p. 14, was used for 1950-78, and extended to 1980 by the growth rate of column 1.
Column 3: This is the index of column 2.

Description of the Index. The index of government administrative services is a weighted average of the separate measures of man-hour employment in the six subsectors. The weights for the subsectors are the value added in each subsector as shown in table D-7. To the extent that labor productivity has increased, man-hour employment understates the growth of the real product rendered by this group of services. An alternative procedure—to deflate current expenditures on these activities by appropriate price indexes—cannot be used because there is little information on nonwage outlays for the sector and suitable price deflators are not available. The procedure used in US accounts is to deflate general government expenditures largely by input price indexes. The man-hour employment data for each subsector are shown in table B-21.

General Agricultural Program. These programs provide general services to agriculture and are apparently financed largely if not entirely from the state budget. The services include plant and animal disease control, general veterinary services and inspection, erosion control and land improvement, management of land tenure procedures, and the like. Activity is measured by an index of man-hour employment obtained as follows:

(1) Employment is estimated in each year as the difference between total reported employment in state agriculture and employment in "state farms, interfarm economic enterprises, subsidiary and other productive agricultural enterprises." Data given in *Trud v SSSR*, Moscow, Statistika, 1968, p. 26, suggest that nearly all of this residual group consists of employees providing veterinary and other services to agriculture.

(2) The average annual number of man-hours was assumed to be the same as in state agriculture as a whole. The latter was calculated for 1950-78 from data on average annual employment and total man-hours worked given in Stephen Rapawy, *Civilian Employment*, p. 24. The average number of man-hours in 1979 and 1980 was assumed to be the same as in 1978.

Forestry. This activity encompasses enterprises and organizations engaged in the management and protection of state forests and parks; it is financed largely from the state budget. The man-hour employment data used to measure this activity are given for 1950-78 in Rapawy, *Civilian Employment*, p. 14, and extended to 1980 by the same methodology.

State Administration and the Administrative Organs of Social Organization. This activity includes the operations of state administrative bodies at all levels (ministries, state committees, and the like), legislative and judicial organs, administrative organs of state security and defense, and the administrative organs of trade unions, the Communist Party and other so-called social organizations. The activity of this sector is financed mainly from state budget funds, but also partly from charges to enterprise costs. Social organizations include the administrative organs of the All-Union Society of Consumer Cooperatives, the Communist Party and Komsomol, the trade unions and professional unions, and a number of other groups that are permitted to function (for example, the Red Cross, civil defense, and nature societies). Their activities are financed largely from dues paid by members. The man-hour employment data used to measure this activity are given for 1950-78 in Rapawy, *Civilian Employment*, p. 14, and extended to 1980 by the same methodology.

Culture. Public libraries, museums, parks, zoos, clubs, and children's camps are the principal institutions covered by this sector. Rapawy published data for education and culture combined (*Civilian Employment*, p. 14). The education component is derived in JEC, *Consumption* as part of the consumption index. The remainder forms the index of culture.

Municipal Services. These services consist mainly of the upkeep of city streets and municipal facilities, garbage and trash collection, fire protection, and similar functions. Activity is measured by an index of man-hour employment obtained in the "housing-communal economy and personal services" category of

Table B-21

Million

Man-Hour Employment in Government Administrative Services

Year	General Agricultural Services	Forestry	State Administration and the Administrative Organs of Social Organizations	Municipal Services	Civilian Police	Culture
1950	748	960	3,979	385	1,425	585
1951	811	977	3,920	400	1,404	605
1952	871	993	3,860	415	1,382	624
1953	797	893	3,723	424	1,333	640
1954	827	862	3,326	432	1,191	668
1955	596	832	2,926	440	1,048	695
1956	650	814	2,814	452	1,007	702
1957	623	768	2,649	456	948	712
1958	739	742	2,631	461	942	730
1959	780	693	2,518	464	901	739
1960	948	680	2,370	473	848	752
1961	856	685	2,358	478	844	776
1962	844	705	2,396	494	858	826
1963	832	721	2,376	513	851	871
1964	863	734	2,472	539	885	930
1965	888	725	2,645	559	947	981
1966	940	741	2,802	586	1,003	1,028
1967	1,029	748	2,987	631	1,069	1,131
1968	1,106	766	3,132	663	1,122	1,246
1969	1,122	777	3,301	695	1,182	1,355
1970	1,121	788	3,363	722	1,204	1,467
1971	1,198	791	3,474	765	1,244	1,569
1972	1,252	810	3,597	802	1,288	1,635
1973	1,301	806	3,712	832	1,329	1,712
1974	1,355	817	3,867	867	1,384	1,805
1975	1,418	823	3,994	899	1,430	1,876
1976	1,547	816	4,080	920	1,461	1,949
1977	1,582	819	4,172	953	1,494	2,059
1978	1,681	830	4,277	994	1,531	2,143
1979	1,746	830	4,392	1,025	1,572	2,190
1980	1,844	834	4,518	1,054	1,617	2,243

Sources: See text.

Soviet employment data. The share of municipal services in this employment category was estimated at 13 percent in 1970 (CIA, *GNP 1970*, p. 54). In the absence of other information, this share was assumed to be the same in all other years. Man-hour employment in "housing-communal economy and personal services" in 1950-78 is given in Rapawy, *Civilian Employment*, p. 14, and extended to 1980 by the same methodology.

Civilian Police. As a category in Soviet annual statistics on employment in the state sector, civilian police does not exist. In the 1959 population census the Soviets explicitly reported employment for "workers in protection of socialist property and public order"—429,000 persons. The 1970 census does not list such a category. Whether civilian police (militia) are included somewhere in the total number in the state labor force (workers and employees) reported annually in the statistical handbooks is uncertain. Civilian police might be: (1) considered to be part of the armed forces, (2) omitted entirely from unpublished figures on military manpower and from reported data on employment, or (3) included somewhere in the regularly published annual statistics on state employment. The first possibility is ruled out for constructing GNP accounts because of the definition of armed forces that has been adopted. The second treatment is possible, but it seems unlikely that the Soviets would omit them altogether; they are a highly visible and entirely legitimate activity in a modern state. The third possibility seems plausible and is the approach adopted here. The estimate relies in part on the work of Stephen Rapawy, *Comparison of U.S. and U.S.S.R. Civilian Employment in Government*. The argument supporting this approach is as follows:

(1) A large unexplained residual of employment exists in the Soviet category "Other branches of material production." Rapawy estimated this residual at 551,000 in 1966 by deducting from total reported employment in "other branches of material production" the reported employment in component subgroups. No employment was reported for the subgroup "interdepartmental guard," which is classified in "other branches of material production" (*Ukazaniya*, pp. 751-752).

(2) This approach yields an estimate for police employment that seems appropriate to the size and extent of urbanization of the USSR and to the nature of the society. By way of comparison, total government employment in police protection in the United States—a much more urban society—in 1966 was 437,000 (*Statistical Abstract of the United States*, Washington, D. C., Government Printing Office, 1967, p. 439).

(3) To obtain a time series for police employment, the estimate for 1966 was extrapolated on the assumption that the trend in police employment is the same as reported for state administration and the administrative organs of social organizations. Both groups would be likely to have been affected by the shakeup in the police and bureaucracy that occurred during the 1950s; this phenomenon is reflected in the statistics. This approach yields a figure of 452,000 for police employment in 1959; the 1959 census reported 429,000 persons as employed in "protection of socialist property and public order."

(4) The alternative to the procedure adopted here is to assume that the function of police protection is omitted from Soviet published employment statistics. To account for what is obviously a sizable activity it would then be necessary to adopt an arbitrary estimate for the number of police, their average wages, and other costs and to make an equally arbitrary assumption about trends over time. Although arbitrary assumptions are also involved in the procedure used here, the results produce a plausible measure of levels and trends in police protection activity.

The index used to measure police protection activity is an index of man-hour employment. Average annual employment was estimated for 1966, as explained above, and extrapolated on the basis of trends in man-hour employment in state administration and the administrative organs of social organizations. Average annual man-hours worked by police were assumed to be the same as for state administration.

Military Personnel

Scope and Coverage

All uniformed personnel of the armed forces—including border guards, internal security, construction troops, and railroad troops—are included in this activity. It should be noted that substantial definitional differences complicate any comparison of the activities of US and Soviet armed forces.

Description of the Index

Separate indexes are computed in established prices and factor-cost prices. The index in established prices is the sum of wages, social security payments, and outlays for subsistence, all computed in 1970 prices. The index takes account of changes in the mix of conscripts, officers, and noncommissioned officers. For the factor-cost index, the conscript costs are replaced by an estimate that attempts to allow for the opportunity cost of conscripts. For this we have used a minimum industrial wage, which is slightly higher than expenditures on military pay and subsistence.

Other Branches

The index for this sector is assumed to be equal to the index for total GNP.

Appendix C

End-Use Indexes

Consumption

The indexes of consumption are described by Gertrude Schroeder and Elizabeth Denton in JEC, *Consumption.*

Investment

Investment is the sum of new fixed investment and capital repair. New fixed investment is the sum of machinery and equipment (producer durables), new construction and other capital outlays, and net additions to livestock.

Soviet investment data are equivalent in concept to the machinery and equipment and construction and other capital outlays components of new fixed investment. The Soviet investment data in each edition of the *Narkhoz* are published in "comparable estimate" prices of some base year (primarily 1955 or 1969). Western economists have debated about whether these data are valid measures of the real growth. For example, Becker used the Soviet data for his constant price accounts without any discount for inflation (Becker, *Soviet National Income,* p. 116). On the other hand, Nove asserts that the Soviet data so overstate growth that real investment may actually have fallen in recent years (Alec Nove, "A Note on Growth, Investment and Price Indexes," *Soviet Studies,* January 1981). The uncertainty about the official data has led Western economists to consider alternative series. In this report, we use one such alternative for the construction and other capital outlays component of new fixed investment. We have not yet found an acceptable alternative for the machinery and equipment component. Although our index of industrial production contains a producer durables category, it is not a suitable substitute because of problems relating to foreign trade and inventory changes.

Machinery and Equipment

Scope and Coverage. Investment in machinery and equipment includes all expenditures by state enterprises and organizations and collective farms. Private investment is negligible. By the Soviet definition, this sector now includes the purchase of all new equipment costing more than 100 rubles and lasting longer than one year. Capital repair of machinery and equipment is not included. Soviet investment data do not include expenditures for certain producer durables by budgetary institutions. An estimate of these expenditures in 1970 was made, however, and these purchases are implicitly assumed to have grown at the same rate as other purchases of machinery and equipment.

Description of the Index. The index is based on reported Soviet data on investment in machinery and equipment. These data are said to be in constant prices. There is considerable controversy over the existence and amount of price inflation in the machinery sector. It seems clear from the published data that the Soviets have made some attempt to account for price changes in their investment data. Because a large share of producer durables, perhaps as much as one-third, consists of unique products, all of the inflation in the investment data may not have been eliminated. Nevertheless, it was not possible to construct an alternative series.

Over the years, the Soviets have published investment data in constant 1955, 1969, and 1973 estimate prices. In the 1950s the published data excluded collective farm investment. Table C-1 presents the published values for state investment and estimates of collective farm investment. The values in the various prices are linked to form the index of investment in machinery and equipment.

Construction and Other Capital Outlays

Scope and Coverage. This sector includes all new construction of buildings and structures (including private housing) and certain other expenditures for design work, geological exploration, and drilling. As

Table C-1

Derivation of the Index of Investment in Machinery and Equipment

Year	(1) Expenditures in 1955 Prices (billion rubles)	(2)	(3)	(4) Expenditures in 1969 Prices (billion rubles)	(5) Expenditures in 1973 Prices (billion rubles)	(6) Index (1970 = 100)
	Collective Farms	State Organizations	Total			
1950	0.2	3.0	3.2			13.5
1951	0.2	3.0	3.2			13.5
1952	0.2	3.2	3.4			14.8
1953	0.3	3.3	3.6			15.6
1954	0.3	4.0	4.3			18.4
1955	0.5	4.8	5.3			22.5
1956	0.6	6.0	6.6			28.3
1957	0.6	6.7	7.3			31.1
1958	0.9	7.4	8.3			35.2
1959	1.0	7.9	8.9			38.1
1960	1.0	8.9	9.9			42.2
1961	0.9	9.9	10.8	11.6		45.9
1962	1.1	11.0	12.1	13.1		51.6
1963	1.3	12.1	13.4	14.5		57.0
1964	1.5	13.7	15.2	16.4		64.8
1965	1.7	14.6	16.3	17.5	16.9	69.3
1966			17.2	18.5		73.4
1967			18.6	19.9		78.7
1968			20.3	21.5		84.8
1969			20.9	22.5		88.9
1970				25.3	24.4	100.0
1971				26.6	25.7	105.3
1972				28.8	27.8	113.9
1973				31.1	29.9	122.5
1974				34.1	32.9	134.8
1975				38.5	37.1	152.0
1976					40.7	166.8
1977					43.0	176.2

Table C-1 (Continued)

Year	(1) Expenditures in 1955 Prices (billion rubles)	(2)	(3)	(4) Expenditures in 1969 Prices (billion rubles)	(5) Expenditures in 1973 Prices (billion rubles)	(6) Index (1970 = 100)
	Collective Farms	State Organizations	Total			
1978					46.6	191.0
1979					48.6	199.2
1980					50.9	208.6

Sources: Column 1: 1950-55 are estimated by assuming that the share of machinery and equipment in total *kolkhoz* investment was constant. Total *kolkhoz* investment in machinery and equipment for 1951-55 is derived as total investment in machinery and equipment (19.8 billion rubles—*Narkhoz 1969*, p. 502) less non-*kolkhoz* investment in machinery and equipment (18.3 billion rubles—*Narkhoz 1965*, p. 529). Annual data on total *kolkhoz* investment are from *Kapital'noye stroitel'stvo v SSSR*, Moscow, Gosstatizdat, 1961, p. 40; and *Narkhoz 1965*, p. 536. The implied share of machinery and equipment in *kolkhoz* investment for 1951-55 is 22 percent. This share is assumed to hold for 1950 also. 1956-60 are first estimated by multiplying the share of machinery and equipment in total agricultural investment (*Kapital'noye stroitel'stvo*, p. 159) by total *kolkhoz* investment. These estimates are then adjusted to agree with control totals for 1956-58 and 1959-60. *Kolkhoz* investment in machinery and equipment for 1956-58 and 1959-60 are derived from data in *Strana soveta za 50 let*, Moscow, Statistika, 1967, pp. 198-199; *Narkhoz 1969*, p. 502; and *Narkhoz 1965*, p. 529. 1961-65 are calculated as column 3 less column 2.
Column 2: This is from *Narkhoz 1965*, p. 529.
Column 3: 1950-60 are column 1 plus column 2. 1961-69 are from *Narkhoz 1969*, p. 502.
Columns 4 and 5: These are from *Narkhoz 1975*, p. 503, and similar tables in other issues.
Column 6: This was derived by linking the data in columns 3, 4, and 5. Data for 1961-64 and 1966-69 are derived from column 4, and data for 1950-60 are derived from column 3.

with investment in machinery and equipment, the Central Statistical Administration may not have completely eliminated inflation from the construction statistics. Measurement of the real change in construction has proved troublesome in Western economies as well as in the Soviet Union. In the United States, price deflators are used based on certain types of standard construction projects, but it is suspected that the real growth of investment in construction has been significantly understated.

Description of the Index. Because of the Soviet definition of its construction sector, an independent index of the construction component of investment can be estimated. The Soviets define the entire output of the construction sector as capital expenditures. Therefore, our sector-of-origin index of the output of the construction sector in constant prices, described in appendix B, represents the growth of new construction and other capital outlays plus capital repair of buildings and structures. In order to derive the index of new construction and other capital outlays, we first estimate capital repair expenditures on buildings and structures in current prices (see below) and then subtract that series from the Soviet published values on the gross output of the construction sector in current prices. The result is an estimate of new construction and other capital outlays in current prices. Both component series are then deflated by the implicit price index obtained by comparing our index of construction output in constant prices with the Soviet gross output series in current prices. Table C-2 shows the derivation of our estimated series on new construction and other capital outlays in current prices and in 1970 prices. Our estimates in 1970 prices are also compared with *Narkhoz* data in 1969 prices (column 5) and an implicit price index is derived (column 6). The series in 1970 prices shows slower growth over the 1961-78 period (4.9 percent per year versus 5.8 percent). The relationship is not consistent, however, as the implicit price index declines in several years.

Table C-2

Derivation of Investment in New Construction and Other Capital Outlays

Year	(1) Gross Output of Construction Sector (billion rubles)	(2) Capital Repair of Buildings and Structures (billion rubles)	(3) Investment in New Construction and Other Capital Outlays (billion rubles)	(4) Investment in New Construction and Other Capital Outlays (billion 1970 rubles)	(5) Investment in New Construction and Other Capital Outlays (billion 1969 rubles)	(6) Implicit Price Index (1970 = 100)
1950	12.1	1.2	10.9	12.4	NA	NA
1951	13.6	1.3	12.3	14.2	NA	NA
1952	15.3	1.3	14.1	15.9	NA	NA
1953	16.1	1.4	14.7	17.5	NA	NA
1954	18.2	1.6	16.5	19.4	NA	NA
1955	18.4	2.0	16.4	21.5	NA	NA
1956	20.3	2.7	17.7	22.8	NA	NA
1957	22.6	3.3	19.3	24.9	NA	NA
1958	25.7	3.8	21.9	28.1	NA	NA
1959	29.2	4.2	25.0	31.7	NA	NA
1960	31.9	4.5	27.4	34.2	NA	NA
1961	32.7	4.8	27.9	35.8	32.2	94.9
1962	33.6	4.9	28.7	37.5	32.8	92.2
1963	34.7	5.1	29.6	38.9	33.8	91.6
1964	36.6	5.5	31.0	40.6	36.2	94.0
1965	40.3	5.6	34.7	43.8	39.5	95.1
1966	43.0	6.2	36.8	45.6	42.5	98.3
1967	50.0	6.6	43.4	49.8	46.1	97.6
1968	53.0	6.9	46.1	52.5	49.7	99.8
1969	60.0	7.4	52.6	55.1	51.1	97.8
1970	67.6	7.8	59.8	59.8	56.7	100.0
1971	74.7	8.8	65.9	63.6	61.4	101.8
1972	77.4	9.3	68.1	66.8	65.5	103.4
1973	80.9	10.1	70.8	70.3	67.6	101.4
1974	86.4	11.2	75.2	73.5	71.6	102.7
1975	91.7	12.4	79.3	76.7	76.4	105.1
1976	94.2	13.5	80.7	78.5	77.9	104.7
1977	96.2	14.7	81.5	79.5	79.9	107.3
1978	99.2	16.0	83.2	81.0	83.8	109.1
1979	NA	NA	NA	83.3	NA	NA
1980	NA	NA	NA	84.7	NA	NA

Sources: Column 1: See table B-3, column 1.

Column 2: See text.

Column 3: This is column 1 less column 2.

Column 4: This is column 3 deflated by the price index derived in table B-3, column 4. Figures for 1979 and 1980 are estimated using the growth rate of the gross output of total construction in 1970 prices (table B-3, column 2), and the assumption that the growth rate of capital repair expenditures is double that of new construction and other capital outlays.

Column 5: See *Narkhoz 1972*, p. 474, and similar tables in other issues.

Column 6: This is derived from a comparison of columns 4 and 5.

Net Additions to Livestock
This index is derived by Margaret Hughes and Barbara Severin in JEC, *Agriculture*.

Capital Repair
Scope and Coverage. This sector includes the capital repair of machinery and equipment and of buildings and structures. It defies comparison with similar activities in US or other Western GNP accounts because much of the comparable activity evidently is either charged to current expenses or included with new fixed investment in Western statistics.

Description of the Index. The index is the sum of two deflated current-price series—capital repair of machinery and equipment and capital repair of buildings and structures. Both series are derived in an unpublished working paper by Scot Butler ("The Growth of Capital Repair in the USSR, 1950-77"). First total capital repair expenditures are estimated, based mainly on current-price amortization deductions for capital repair. A series on capital repair of buildings and structures is then derived based mainly on budgetary expenditure data. Using estimated expenditures in 1970, the two indexes are converted to 1970 ruble values, and expenditures for capital repair of machinery and equipment are derived as a residual.

The two components of capital repair are deflated separately to constant 1970 prices. The price deflator for total construction (table B-3, column 4) is used also for capital repair of buildings and structures. Expenditures for capital repair of machinery and equipment are deflated by a price index based on a comparison of the gross output of the machinery sector in current and constant prices. The current-price series for machinery output is built up from data on wages, social security deductions, the ratio of wages and social security deductions to production costs, and profits. The index of machinery output in constant prices is derived in the same manner as the index of the value added in the machinery sector (described by Ray Converse in JEC, *Industry*), but gross output weights are used to combine the various machinery subsector indexes rather than value-added weights. The deflated machinery capital repair series and the derivation of the total capital repair series are shown in table C-3.

Other Government Expenditures

Government Administrative Services
The indexes used to measure this activity are the same as those used for the sector-of-origin indexes. Theoretically, a separate measure of real trends in material purchases should be added to the measure of trends in employment. Despite a considerable amount of research, it has not proved feasible to produce reliable estimates of material purchases, nor can a suitable price deflator be obtained. According to one Soviet estimate, material expenditures in administration in current prices increased at about the same rate as man-hour employment during 1960-72 (V. M. Rutgayzer, *Resursy razvitiya neproizvodstvennoy sfery*, pp. 157-158). The weights used to combine the subsector indexes are the end-use expenditures in 1970.

Research and Development
This index is the same as that used for science as a sector of origin.

Outlays Not Elsewhere Classified (n.e.c.)
The item is derived as a residual by subtracting all identified end-use components from total GNP derived from the sector-of-origin data.

Defense
As stated in the main report, defense expenditures are not computed as a separate component of GNP by end use because it is believed that other components, primarily investment and research and development, include substantial amounts of defense expenditures.

The CIA does periodically estimate the cost of Soviet defense activities based on a detailed list of the physical elements of their defense programs and ruble values derived from a variety of sources. Using data in this report, we have converted these estimates to factor-cost prices. Table C-4 shows these estimates as ranges.

Although it has not been possible to integrate the estimates of total defense expenditures with our GNP data, we have made some sample calculations based

Table C-3

Derivation of the Index of Capital Repair Expenditures

Year	(1) Capital Repair of Machinery and Equipment (current prices)	(2) Machinery Price Index (1970 = 100)	(3) Capital Repair of Machinery and Equipment (billion 1970 rubles)	(4) Capital Repair of Buildings and Structures (billion 1970 rubles)	(5) Total Capital Repair (billion 1970 rubles)
1950	1.5	NA	1.6	1.4	3.0
1951	1.6	NA	1.8	1.5	3.3
1952	1.8	NA	2.1	1.4	3.6
1953	2.1	NA	2.3	1.7	4.0
1954	2.2	NA	2.4	1.9	4.4
1955	2.3	86.6	2.6	2.6	5.3
1956	2.1	NA	2.8	3.5	6.3
1957	2.1	NA	3.0	4.2	7.2
1958	2.3	69.9	3.3	4.9	8.1
1959	3.1	73.4	4.2	5.3	9.5
1960	3.4	77.2	4.5	5.6	10.1
1961	3.8	81.0	4.7	6.1	10.9
1962	4.4	80.4	5.5	6.4	11.9
1963	5.7	82.9	6.9	6.7	13.6
1964	6.2	83.1	7.4	7.3	14.7
1965	7.0	83.2	8.5	7.1	15.6
1966	7.6	90.4	8.4	7.7	16.1
1967	8.3	94.0	8.8	7.5	16.4
1968	9.1	95.9	9.5	7.8	17.4
1969	10.1	98.0	10.3	7.7	18.0
1970	11.2	100.0	11.2	7.8	19.0
1971	12.2	96.1	12.6	8.5	21.2
1972	13.7	97.7	14.0	9.1	23.1
1973	15.2	93.5	16.2	10.0	26.2
1974	16.5	94.6	17.4	11.0	28.4
1975	15.3	96.1	15.9	12.0	27.9
1976	16.4	93.8	17.5	13.1	30.6
1977	17.5	93.6	18.7	14.4	33.1
1978	18.6	95.5	19.4	15.6	35.1
1979	19.5	96.6	20.2	15.8	36.1
1980	20.6	97.6	21.1	16.5	37.6

Sources: Columns 1 and 2: See text. Data are not available to calculate the current-price machinery series for 1950-54 and 1956-57 and, hence, the price index.

Column 3: This is column 1 deflated by the price index in column 2. The values for 1950-54 and 1956-57 are estimated by using a series of expenditures for capital repair of machinery and equipment in 1937 prices derived from data estimated by Moorsteen and Powell, *The Soviet Capital Stock, 1928-1962*, pp. 386-387.

Column 4: This is table C-2, column 2, deflated by the price index in table B-3, column 4.

Column 5: This is column 3 plus column 4.

Table C-4

Billion 1970 Rubles, Factor-Cost Prices

Estimated Soviet Defense Expenditures, 1951-80

Year	Upper Bound	Lower Bound
1951	33	19
1952	33	20
1953	30	19
1954	31	20
1955	36	24
1956	34	23
1957	30	21
1958	30	22
1959	29	22
1960	31	23
1961	34	26
1962	38	29
1963	39	31
1964	42	34
1965	43	35
1966	44	36
1967	47	39
1968	50	42
1969	52	43
1970	53	44
1971	54	45
1972	56	46
1973	58	48
1974	62	51
1975	65	53
1976	69	56
1977	70	56
1978	72	57
1979	75	59
1980	79	62

on assumptions about the proportions of the identified components of GNP which might represent defense expenditures. These calculations indicate that the independent estimates of defense expenditures are reasonably consistent with our GNP data.

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Appendix D

Revised 1970 GNP Accounts in Established Prices

The original estimate of Soviet GNP for 1970 was documented in CIA, *GNP 1970*. This appendix revises that estimate by incorporating new information and reinterpreting some old evidence. The basic accounting structure is unchanged. The first part of this appendix summarizes the most important changes we have made in the four basic accounts (household incomes and outlays and public-sector incomes and outlays) and the consequent changes in the combination of those accounts to form GNP. The rest of the appendix consists of the revised basic tables which comprise the GNP accounts, several supporting tables, and detailed sources for all tables.

Household Incomes

There are three significant revisions to the estimate of household incomes (table D-1). First, total income, which is determined by total outlays, is 1.7 billion rubles lower than in CIA, *GNP 1970*. Second, military subsistence has been revised upward by 1.2 billion rubles. Third, the first two revisions plus other, smaller changes mean that the unidentified money income residual has been reduced by 3.6 billion rubles. The residual is determined as total outlays less all identified incomes.

In addition there have been numerous small changes. In particular, earnings in the various private services have been reestimated. Included is an increase in private earnings in health and education from 1 to 5 percent of the wage bills of state health and education based on reports of widespread private activities of this type. There is one small change in the accounting structure of household incomes from that published in CIA, *GNP 1970*. The profits distributed to consumer cooperative members are now considered to be a transfer receipt rather than earned income. This change does not affect the value of GNP because these profits are now reflected as an income of the public sector.

Household Outlays

Household outlays are 1.7 billion rubles lower than in CIA, *GNP 1970* (table D-2). The lower total is mainly the result of reductions in our estimates of household expenditures for goods, transportation, private housing construction, and recreation. Offsetting these reductions are upward revisions of estimated expenditures for repair and personal care, health, and education services and for military subsistence.

Expenditures for goods have been reduced by 2.1 billion rubles to eliminate expenditures for secondhand goods in commission stores, business travel, and materials which are also included in the cost of certain repair services.

Transportation expenditures have been reduced by 25 percent, or 1.8 billion rubles, to eliminate business travel expenditures. The value of private housing construction reported in the *Narkhoz* was previously thought to be in 1955 prices and was adjusted to 1970 prices. We now believe that it is reported in current prices. This reinterpretation reduces investment expenditures by 0.3 billion rubles. Expenditures on hotels (part of recreation expenditures) have been reduced by 0.1 billion rubles to eliminate business travel expenditures.

Household expenditures for repair and personal care services were increased to include the value of materials used for the repair and custom making of clothing and knitted goods. At the same time deductions were made to eliminate sales to enterprises of all repair and personal care services. The net increase in household outlays for repair and personal care services is 0.8 billion rubles. Household expenditures for health and education and the value of military subsistence were all increased in the same manner as household incomes from these sources.

Trade union and other dues were considered an element of consumption in CIA, *GNP 1970*. They are now classified as a transfer outlay since the dues are used mainly to finance social-cultural and administrative activities rather than to provide services to members of the trade unions and other organizations. This change does not affect total household outlays or total GNP, but it does lower total consumption expenditures.

Public-Sector Incomes

Public-sector incomes have increased 6.7 billion rubles (table D-3). The most important changes are: (1) the addition of several charges to enterprise costs for special funds (2.1 billion rubles), (2) an increase in the miscellaneous charges component of taxes and other payments to the budget (1.6 billion rubles), (3) the deletion of the subsidy on milk products (0.8 billion rubles), and (4) the addition of trade union and other dues to transfer receipts (2.1 billion rubles).

The charges to enterprise costs represent funds collected to support expenditures on certain components of GNP by end use (for example, science expenditures) which are charged to current expenses in the Soviet accounting system. The information on the number of these funds and their size, however, is sparse. The likelihood of large percentage errors in these estimates remains.

The method used to estimate the miscellaneous charges component of taxes and other payments to the budget has been completely revised. Although the revised value is 1.6 billion rubles higher than in CIA, *GNP 1970*, it actually has been reduced because we now explicitly include income earned from foreign trade. This item, 7.6 billion rubles, was previously excluded from GNP. Foreign trade income results from the differences between the domestic prices of traded goods and their equivalent foreign trade prices. We now consider the price differences to be equivalent to a tax or subsidy and, in agreement with Western accounting practices, include the income as a part of GNP.

The subsidy on milk products was deleted because new information indicates it is netted against the value of profits reported in the *Narkhoz*. Trade union and other dues are now considered as a transfer payment as described above.

Public-Sector Outlays

Total income provides the control total for the public sector and, therefore, public-sector outlays have also risen 6.7 billion rubles (table D-4). There have been substantial structural changes in addition to the increased total. Expenditures for communal and administrative services have decreased by 6.0 billion rubles while investment outlays increased 4.6 billion rubles and outlays n.e.c. increased 7.4 billion rubles.

Expenditures on communal services (education, health, and physical culture) are estimated by a new methodology and are considerably lower than the estimates published in CIA, *GNP 1970*. Previously we used *Narkhoz* data relating to expenditures on summary groups of services from the budget and other sources. Because of many ambiguities in these data and the discovery that they include imputed depreciation charges of unknown size, we now estimate expenditures for communal services as the sum of wages, social insurance, and other current outlays. In addition, expenditures for art have been deleted because they already were included with recreation expenditures, and expenditures for physical culture were reduced to account for the trade union subsidy on resort passes.

Expenditures for government administrative services have been reduced by 0.9 billion rubles. Most of this amount is the result of a decision to lower the share of other current outlays in total expenditures from one-third to one-fourth.

Investment expenditures have been increased by 4.6 billion rubles. The primary changes are the addition of an estimate for the acquisition of equipment by budget institutions and a revised method for estimating the value of new construction and other capital outlays. In addition, smaller revisions were made to the value of net additions to livestock inventories and capital repair expenditures.

Outlays n.e.c., determined as total public-sector incomes less identified public-sector outlays, is 7.4 billion rubles larger than in CIA, *GNP 1970*. The revised accounting of foreign trade income, however, means that net exports, a component of outlays n.e.c., are now valued in foreign trade prices. As a result, the portion of outlays n.e.c. which might be associated with defense expenditures, changes in strategic reserves, or a statistical discrepancy is virtually unchanged from that computed in CIA, *GNP 1970* (p. 16).

GNP by End Use

The GNP of the Soviet Union is estimated by combining the relevant portions of the outlays of the household and public sectors (table D-5). As a result of the changes made in these accounts, total GNP is now 2.5 billion rubles higher than calculated in CIA, *GNP 1970*. The changes in the important components of GNP by end use are shown in the following tabulation:

	GNP by End Use (percent)	
	Original Estimate	Current Estimate
Consumption	57.7	55.1
Goods	44.0	43.4
Services	13.7	11.6
Investment	31.6	32.5
Other government expenditures	10.8	12.5

GNP by Sector of Origin

The growth of GNP in 1970 prices is measured as an aggregation of the growth rates of the various sectors of origin. In order to compute the growth of GNP, it is necessary to estimate how much of each type of income (table D-6) was earned in each sector of origin (table D-7). Tables D-8 through D-16 show the distribution of each type of income by sector of origin.

Table D-1

Billion Rubles

Soviet Household Incomes, 1970

1. State wages and salaries	132.032
2. Net income of households from agriculture	41.709
a. Money wage payments by collective farms	14.453
(1) Payments to collective farm members	14.040
(2) Payments to hired workers	0.413
b. Net income from sales of farm products	8.314
c. Net farm income in kind	18.942
(1) Consumption in kind	18.347
(2) Investment in kind	0.595
3. Income of the armed forces	6.580
a. Military pay and allowances	3.380
b. Military subsistence	3.200
4. Other money income currently earned and statistical discrepancy	10.598
a. Private money income currently earned	3.134
(1) Private earnings in construction	0.290
(2) Private earnings in services	2.844
(a) Housing repair	0.804
(b) Other private repair and personal care services	0.836
(c) Private room rentals	0.484
(d) Education	0.470
(e) Health	0.250
b. Unidentified money income and statistical discrepancy	7.464
5. Imputed net rent	1.080
6. Imputed value of owner-supplied construction services	0.579
7. Total income currently earned	192.578
8. Transfer receipts	24.628
a. Pensions and allowances	22.300
b. Stipends	1.300
c. Interest income	1.035
d. Net new bank loans to households	−0.034
e. Profits distributed to consumer cooperative members	0.027
9. Total income	217.206

Sources to this table:

1. *State wages and salaries* are from CIA, *GNP 1970*, p. 23.

2. *Net income of households from agriculture*

a. *Money wage payments by collective farms.*

(1) *Payments to collective farm members* are from CIA, *GNP 1970*, p. 23.

(2) *Payments to hired workers* are from CIA, *GNP 1970*, p. 23.

b. *Net income from sales of farm products.* This item (8.314 billion rubles) is derived as the difference between gross income from the sale of farm products (9.238 billion rubles—CIA, *GNP 1970*, p. 23) and purchases of materials and services (0.924 billion rubles—Ibid).

c. *Net farm income in kind.*

(1) *Consumption in kind* is from CIA, *GNP 1970*, pp. 24-25.

(2) *Investment in kind*, a monetary valuation of the net additions to private livestock inventories, is estimated at 0.595 billion rubles on the basis of the change in numbers of cattle, hogs, sheep and goats, and poultry and the estimated average realized price per head for each animal. The calculation is presented below:

Valuation of the Net Additions to Private-Sector Livestock Inventories, 1970

	(1) Inventory of Animals (thousand head)	(2)	(3) Net Additions to Livestock Inventories	(4)	(5)
	End 1969	End 1970	Thousand Head	Rubles Per Head	Billion Rubles
Cattle	24,989	24,953	−36	442	−0.016
Hogs	13,830	16,562	2,732	173	0.473
Sheep and goats	31,665	33,180	1,515	37	0.056
Poultry	360,126	376,480	16,354	5	0.082
Total					**0.595**

Sources: All data are from CIA, *GNP 1970*, p. 57, except for poultry. The poultry inventory data are from *Selkhoz 1971*, p. 273. The poultry price is derived by Margaret Hughes and Barbara Severin in JEC, *Agriculture*, p. 51.

3. ***Income of the armed forces***

a. ***Military pay***. This is a CIA estimate.

b. ***Military subsistence***. This is a CIA estimate.

4. ***Other money income currently earned and statistical discrepancy***

a. ***Private money income currently earned.***

(1) ***Private earnings in construction*** (0.290 billion rubles) are based on total expenditures for private housing construction (1.636 billion rubles—*Narkhoz 1972*, p. 486) and assumptions about the distribution of those expenditures. Contrary to the view expressed in CIA, *GNP 1970*, p. 43 we now believe that the reported value for private housing construction is in current prices rather than 1955 prices.

Private housing is constructed by state organizations and by private groups. The value of state-provided private housing construction and repair services in 1970 was 394.7 million rubles (*Narkhoz 1972*, p. 621). This value is believed to include sales to enterprises, as do the reported sales of other state-provided services. They probably represent repairs done for enterprises without their own repair crews. Based on data published by V. I. Dmitriev (*Metodologicheskiye osnovy prognozirovaniya sprosa na bytovyye uslugi*, Moscow, Legkaya Industriya, 1975, p. 98), sales to enterprises are estimated at 5 percent of state-provided services, or 19.7 million rubles. The remainder (375.0 million rubles) are sales to households. These sales are arbitrarily divided roughly equally between new construction and repair. The resulting distribution of state-provided private housing construction and repair services is as follows:

	Million Rubles
Total sales	394.7
Sales to enterprises	19.7
Sales to households	375.0
Housing repair	187.0
New construction	188.0

Privately provided private housing construction is calculated as total private housing construction (1.636 billion rubles) less state-provided private housing construction (0.188 billion rubles), or 1.448 billion rubles. Of this amount, 60 percent is assumed to be labor payments and 40 percent, materials. The labor payments are further assumed to be one-third hired labor and two-thirds owner-supplied construction services. The resulting distribution of private housing construction expenditures is:

	Billion Rubles
Total private housing construction expenditures	1.636
State-provided construction	0.188
Privately provided construction	1.448
Materials	0.579
Labor payments	0.869
Private earnings in construction	0.290
Owner-supplied construction services	0.579

(2) *Private earnings in services*

(a) *Housing repair* earnings (0.804 billion rubles) are estimated as total expenditures on housing repair less purchases of state-provided services and of materials used in privately provided repair services. Household expenditures for housing repair are estimated at 1.258 billion rubles (CIA, *GNP 1970*, p. 41). Purchases from state enterprises were estimated above in item 4,a,(1) at 0.187 billion rubles; this figure implies that purchases of privately supplied housing repair services were 1.071 billion rubles. Of this amount, expenditures for materials are estimated at 0.267 billion rubles. Private earnings in housing repair are calculated as a residual (1.071 billion rubles less 0.267 billion rubles).

The material expenditures of 0.267 billion rubles are determined as total retail sales of construction materials to households (1.221 billion rubles—CIA, *GNP 1970*, p. 39) less other uses of those materials. Construction materials purchased by households are assumed to be used for privately provided housing repair, for state-provided private housing repair and construction, and for privately provided housing construction. In item 4,a,(1) above the materials used in privately provided housing construction were estimated at 0.579 billion rubles. As with other services included in the retail trade statistics, the entire value of state-provided housing construction and repair services is assumed to be included in the listed purchases of construction materials. The residual retail sales of construction materials to households are 0.267 billion rubles:

	Billion Rubles
Total retail sales of construction materials to households	1.221
Less:	
Materials used in privately provided new housing construction	0.579
Materials used in state-provided private housing repair and construction services	0.375
Equals:	
Materials used in privately provided housing repair services	0.267

(b) *Other private repair and personal care* earnings (0.836 billion rubles) are estimated at 90 percent of household expenditures on these services. Expenditures (0.929 billion rubles) are derived as the difference between total household expenditures on privately provided services (2.0 billion rubles—CIA, *GNP 1970*, p. 42), and expenditures on privately provided housing repair services (1.071 billion rubles—item 4,a,(2),(a) above).

(c) *Private room rental* earnings are from CIA, *GNP 1970*, p. 42.

(d) *Education* earnings (0.470 billion rubles) are equal to household expenditures for private educational services, which are assumed to be 5 percent of the state wage bill for education. The state wage bill (9.400 billion rubles) is derived in item 1,a of table D-4.

(e) *Health* earnings (0.250 billion rubles) are equal to household expenditures for private health services, which are assumed to be 5 percent of the state wage bill for health. The state wage bill (5.004 billion rubles) is derived in item 1,b of table D-4.

b. *Unidentified money income and statistical discrepancy*. This item is derived as the difference between total income (item 9, below) and the sum of items 1; 2; 3; 4,a; 5; 6; and 8.

5. *Imputed net rent*. This is from CIA, *GNP 1970*, p. 41.

6. *Imputed value of owner-supplied construction services*. See item 4,a,(1) above.

7. *Total income currently earned*. This was derived as the sum of items 1 through 6.

8. *Transfer receipts*

a. *Pensions and allowances*. See *Narkhoz 1972*, p. 535.

b. *Stipends*. See CIA, *GNP 1970*, p. 26.

c. *Interest income*. See CIA, *GNP 1970*, p. 26.

d. *Net new bank loans to households*. See CIA, *GNP 1970*, p. 26.

e. *Profits distributed to consumer cooperative members*. See CIA, *GNP 1970*, p. 23.

9. *Total income*. This is equal to total outlays (table D-2, item 8).

Table D-2

Billion Rubles

Soviet Household Outlays, 1970

1. Retail sales of goods for consumption	144.931
a. State, cooperative, and commission sales	141.096
(1) Food	84.104
(2) Soft goods	42.734
(3) Durables	14.258
b. Collective farm ex-village market sales	3.835
(1) Food	3.617
(2) Soft goods	0.218
2. Consumer services	23.337
a. Housing	3.429
(1) Gross rent	2.733
(2) Repair	0.696
b. Other services	19.908
(1) Utilities	3.478
(2) Transportation	5.400
(3) Communications	1.200
(4) Repair and personal care	5.497
(5) Recreation	2.547
(6) Education	1.441
(7) Health	0.345
3. Consumption in kind	21.547
a. Farm consumption in kind	18.347
(1) Food	18.235
(2) Soft goods	0.112
b. Military subsistence	3.200
(1) Food	1.970
(2) Soft goods	1.230
4. Total outlays for consumption	189.815
5. Investment	2.231
a. Private housing construction	1.636
b. Farm investment in kind	0.595
6. Total outlays for consumption and investment	192.046
7. Transfer outlays	25.160
a. Net savings	9.720
b. Direct taxes	12.737
c. Other payments to the state	2.703
8. Total outlays	217.206

Sources to this table:

1. *Retail sales of goods for consumption*

a. *State, cooperative, and commission sales.*

Total sales to households of consumption goods are estimated as follows:

	Billion Rubles
Total state and cooperative retail sales, including commission sales	155.208
Less:	
Sales to institutions	7.177
Producer goods sold to farm households	0.462
Construction materials sold to households	1.221
Kerosene	0.131
Film rentals	0.195
Commission sales and sales to rental agencies	0.699
Business travel expenditures	0.301
Services included in retail sales	3.926
Equals:	
Sales of goods to households for consuption	141.096

The values for all items are from CIA, *GNP 1970*, p. 39 except for commission sales and sales to rental agencies, business travel expenditures, and services included in retail sales. An arbitrary deduction of 1.0 billion rubles is made to cover sales of secondhand goods in commission stores, sales to rental agencies, and purchases of restaurant meals by persons on business travel. These items are known to be included in reported retail sales, but their amounts are unknown. It is further assumed that the latter is equal to 2 percent of the reported sales of public catering establishments (15.033 billion rubles—*Narkhoz 1972*, p. 578), or 0.301 billion rubles. This amount was subtracted from the 1.0-billion-ruble total to obtain the value for sales of secondhand goods in commission stores and sales to rental agencies.

The values of services included in retail trade have been modified from those listed in CIA, *GNP 1970*, p. 39, as follows:

- Sales of laundry and photo services have been added because they are classified as productive services (*Ukazaniya*, pp. 763-764).
- Sales of housing construction and repair services have been deleted because they are believed to be included in the reported retail sales of construction materials, which are deducted as a separate item in the list above.
- The values published in the *Narkhoz* for the repair and tailoring of clothing and the repair of knitwear were doubled to account for the materials used by these services. These materials are included in

retail sales data but not in the reported sales of the services. A comparison of the reported sales of these two items with and without materials (*Narkhoz 1968*, p. 664; and *Narkhoz 1969*, p. 660) shows that materials are roughly one-half of total sales.

The value of productive services included in retail sales is derived in the following tabulation:

	Billion Rubles
Total productive services	3.9259
Shoe repair	0.3499
Repair and tailoring of clothing	2.0902
Processing expenses	1.0451
Materials	1.0451
Repair of knitwear	0.2404
Processing expenses	0.1202
Materials	0.1202
Repair of durables	0.4428
Furniture repair	0.1006
Dry cleaning	0.0951
Laundries	0.1647
Photo services	0.1491
Other productive services	0.2931

Retail sales to households of goods for consumption are divided among food, soft goods, and durables in the tabulation below:

	Billion Rubles				
	Total	Food	Soft Goods	Durables	Other and Unidentified
Total state and cooperative retail sales, including commission sales	155.208	88.948	45.092	14.856	6.312
Less:					
Sales to institutions	7.177	4.543	1.052	1.253	0.329
Producer goods sold to farm households	0.462				0.462
Construction materials sold to households	1.221				1.221
Kerosene	0.131		0.131		
Film rentals	0.195				0.195
Commission sales and sales to rental agencies	0.699		0.140	0.559	
Business travel expenditures	0.301	0.301			
Services included in retail sales	3.926		3.087	0.839	
Unidentified retail sales			−2.052	−2.053	4.105
Equals:					
Sales to households of goods for consumption	141.096	84.104	42.734	14.258	

Table D-2 (Continued)

Sources to this table (Continued):

Total sales of food include the entire food category in the enumeration of retail sales by type of good (86.168 billion rubles—*Narkhoz 1972*, p. 584) plus sales of tobacco goods (2.780 billion rubles—Ibid, p. 585).

Total identified sales of soft goods are derived from the *Narkhoz* data (Ibid, pp. 584-585) as follows:

	Billion Rubles
Total retail sales of soft goods	45.092
Cloth	5.026
Clothing	15.278
Knitwear	8.567
Shoes	7.693
Laundry soap	0.262
Synthetic cleaning materials	0.435
Toilet soap and perfumes	1.176
Haberdashery	3.638
Matches	0.137
Kerosene	0.131
Notebooks and paper	1.015
Publications	1.734

Total identified sales of durables are derived from the *Narkhoz* data (Ibid, p. 585) as follows:

	Billion Rubles
Total retail sales of durables	14.856
Furniture, carpets, and metal beds	3.604
Metal dishes	0.961
Glass dishes	0.617
Sporting goods	0.542
Radio goods	2.832
Musical instruments	0.281
Toys	0.649
Bicycles and motorbikes	1.009
Watches	0.578
Jewelry	0.533
Electrical goods	2.050
Sewing machines	0.104
Automobiles	0.520
Other household goods	0.576

Other and unidentified retail sales include: window glass (0.050 billion rubles); lumber, cement, and other construction materials (1.500 billion rubles); and an unidentified residual (5.282 billion rubles).

The sales to institutions are allocated as in CIA, *GNP 1970*, pp. 61-62. The 0.329 billion rubles in the other and unidentified column represents institutional purchases of window glass and lumber, cement, and other construction materials. Producer goods sold to farm households and film rentals are assumed to be in the unidentified residual. The value of construction materials sold to households is the difference between: (a) total sales of window glass and lumber, cement, and other construction materials and (b) institutional purchases of the same.

Commission sales and sales to rental agencies are believed to consist mainly of used cars, appliances, furniture, jewelry, and the like. Since these are durable goods, it is assumed that 80 percent of these sales are durables and 20 percent are soft goods. The sales of productive services included in retail sales were divided between soft goods and durables. Those allocated to soft goods are: shoe repair, repair and tailoring of clothing, repair of knitwear, dry cleaning, laundries, and 50 percent of other productive services. Those allocated to durables are: repair of durables, furniture repair, photo services, and 50 percent of other productive services. The remaining unidentified retail sales (4.625 billion rubles) were allocated approximately equally between soft goods and durables.

b. *Collective farm ex-village market sales.* The total value of these sales and their allocation between food and soft goods is from CIA, *GNP 1970*, pp. 40 and 61-62.

2. *Consumer services*

a. *Housing.* The components of this item have been regrouped to conform more closely with the accounting procedures of the United States and the United Nations. Expenditures on housing now consist of:

	Billion Rubles
Total housing expenditures	3.429
Gross rent	2.733
Cash rent for urban public housing	1.016
Charges paid by members of housing cooperatives for maintenance	0.075
Imputed gross rent on urban private and rural housing	1.642
Repair expenditures by tenants of public housing	0.696

This accounting conforms with the US and UN standard, which treats maintenance expenditures by tenants as a final expenditure and maintenance expenditures by owner-occupiers as a portion of gross rent.

b. *Other services*

(1) *Utilities* are from CIA, *GNP 1970*, p. 41.

(2) *Transportation* expenditures are reduced from those in CIA, *GNP 1970*, p. 42 by 25 percent to remove estimated business travel expenditures.

(3) *Communications* expenditures are from CIA, *GNP 1970*, p. 42.

(4) *Repair and personal care* expenditures are derived as the sum of expenditures on state-provided everyday services (4.481 billion

rubles), privately provided services (0.929 billion rubles), and other services (0.087 billion rubles). The state-provided everyday services are from *Narkhoz 1972*, p. 621. The *Narkhoz* data must be adjusted to exclude sales of housing repair and construction and sales to enterprises of all types of services. They also must be adjusted to include the value of materials used in repair and tailoring of clothing and repair of knitwear, which was deducted from the retail sales of goods to households for consumption (item 1, above). According to data published by Dmitriev (*Metodologicheskiye osnovy prognozirovaniya sprosa na bytovyye uslugi*, p. 98), 7.6 percent of the total sales reported in the *Narkhoz* (307.4 million rubles) represent purchases by enterprises. This amount presumably includes sales to enterprises of housing construction and repair services, estimated above at 5 percent of the sales of these services. In order to avoid double counting these sales, only 95 percent of the published value of housing construction and repair value is deducted. Similarly, the purchases of clothing and knitted materials must be added, net of the portion sold to enterprises. The latter is estimated at 4 percent of reported sales. Total sales of state-provided everyday services to the population are estimated as follows:

	Million Rubles
Total reported sales of everyday services	4,044.4
Less:	
Enterprise purchases of everyday services	307.4
95 percent of sales of housing construction and repair services	375.0
Plus:	
96 percent of materials used in tailoring and repair of clothing	1,003.3
96 percent of materials used in repair of knitwear	115.4
Equals:	
Sales of everyday services to households	4,480.7

Household expenditures on privately provided services were estimated in table D-1, item 4,a,(2),(b). Expenditures on other services are from CIA, *GNP 1970*, p. 42.

(5) *Recreation* expenditures (2.547 billion rubles) have been reduced by 0.100 billion rubles from the value derived in CIA, *GNP 1970*, p. 42 in order to account for business travel expenses on hotel accommodations. This deduction is an arbitrary value. Household expenditures on recreation are computed as follows:

	Billion Rubles
Total household expenditures on recreation	2.547
Entertainment	1.500
Passes to resorts and the like	0.447
Hotels, motels, and the like	0.062
Private room rentals	0.538

(6) *Education* expenditures by households consist of expenditures for private services (0.470 billion rubles) and fees for public education (0.971 billion rubles). The former is derived in table D-1, item 4,a,(2),(d) and the later in CIA, *GNP 1970*, pp. 42-43.

(7) *Health* expenditures by households consist of expenditures for private services (0.250 billion rubles) and fees paid by parents for children's nursery care (0.095 billion rubles). The former is derived in table D-1, item 4,a,(2),(e) and the latter in CIA, *GNP 1970*, p. 43.

3. *Consumption in kind*

a. ***Farm consumption in kind***. See table D-1, item 2,c,(1).

(1) *Food* is from CIA, *GNP 1970*, p. 61.

(2) *Soft goods* is from CIA, *GNP 1970*, pp. 61-62.

b. *Military subsistence*. See table D-1, item 3,b.

(1) *Food* is a CIA estimate.

(2) *Soft goods* is a CIA estimate.

4. *Total outlays for consumption*. This was derived as the sum of items 1, 2, and 3.

5. ***Investment***

a. ***Private housing construction***. See *Narkhoz 1972*, p. 486.

b. ***Farm investment in kind***. See table D-1, item 2,c,(2).

6. ***Total outlays for consumption and investment***. This was derived as the sum of items 4 and 5.

7. ***Transfer outlays***

a. *Net savings*. This is from CIA, *GNP 1970*, p. 43.

b. ***Direct taxes***. This is from CIA, *GNP 1970*, p. 43.

c. ***Other payments to the state***. This item (2.703 billion rubles) is estimated as the sum of: (1) trade union and other dues (2.066 billion rubles), (2) net lottery ticket purchases (0.254 billion rubles), (3) taxes on land and buildings owned by individuals and cooperatives (0.211 billion rubles), (4) collective-farm-market fees paid by households (0.050 billion rubles), and (5) other state budget revenue from the population (0.122 billion rubles). Trade union and other dues are now treated as transfer outlays because they are used to finance various social-cultural and administrative activities that are included in public-sector outlays. They are estimated as in CIA, *GNP 1970*, pp. 40-41, except for Communist Party dues. These dues (0.390 billion rubles) are derived on the basis of: (1) estimated total membership in 1970 of 14,192,174; the average of membership figures for 1 January 1970 and 1 January 1971 given in *Partiinaya zhizn'*, No. 14, 1973, pp. 9-10; (2) an estimated average annual wage of members of 1830 rubles—25 percent above the level for all state employees (*Narkhoz 1972*, p. 516); and (3) a dues rate of 1.5 percent of wages, the applicable rate given in *Ustav kommunisticheskoy partiy sovetskogo soyuza*, Moscow, Politizdat, 1964, p. 385. Net lottery ticket purchases are from CIA, *GNP 1970*, p. 43. Taxes on land and buildings owned by individuals and cooperatives are from *Gosbyudzhet 1972*, p. 77. Collective-farm-market fees paid by households are from CIA, *GNP 1970*, pp. 23-24. Other state budget revenue from the population is derived as the difference between total state budget revenues from the population (13.844 billion rubles—*Gosbyudzhet 1972*, p. 12), and the sum of: (1) direct taxes from the population (12.737 billion rubles—Ibid), (2) net bond purchases (0.470 billion rubles—Ibid), (3) net lottery ticket purchases (0.254 billion rubles—Ibid), (4) collective-farm-market fees paid by households (0.050 billion rubles—above), and (5) taxes on land and buildings owned by individuals and cooperatives (0.211 billion rubles—above).

8. *Total outlays*. This was derived as the sum of items 6 and 7.

Table D-3 Billion Rubles

Soviet Public-Sector Incomes, 1970

1. Net income retained by organizations	34.809
a. Retained income of collective farms	7.186
b. Retained profits of state enterprises	26.481
c. Retained profits of consumer cooperatives	0.821
d. Retained profits of other organizations	0.321
2. Charges to economic enterprises for special funds	14.521
a. Social insurance and social security	9.436
b. Education	0.400
c. Research	2.578
d. Social-cultural measures and sports activities	0.162
e. Militarized guards	0.880
f. Support for administration of higher echelons	1.065
3. Taxes and other payments to the budget	132.077
a. Tax on income of collective farms	0.666
b. Tax on income of consumer cooperatives	0.462
c. Tax on income of other organizations	0.107
d. Deductions from profits of state enterprises	53.110
e. Turnover tax	53.346
f. Miscellaneous charges	24.386
4. Allowances for subsidized losses n.e.c.	−22.553
5. Consolidated total charges against current product, net of depreciation	158.854
6. Depreciation	31.827
7. Consolidated total charges against current product	190.681
8. Transfer receipts	25.160
a. Net savings of households	9.720
b. Direct taxes	12.737
c. Other payments to the state	2.703
9. Consolidated net income	215.841

Sources to this table:

1.*Net income retained by organizations*

a. *Retained income of collective farms.* See CIA, *GNP 1970*, p. 45.

b. *Retained profits of state enterprises.* See CIA, *GNP 1970*, p. 45.

c. *Retained profits of consumer cooperatives.* This item (0.821 billion rubles) is the difference between net profits (1.321 billion rubles) and the sum of (1) income taxes (0.462 billion rubles) and (2) premiums paid to employees (0.038 billion rubles). All data are from CIA, *GNP 1970*, pp. 45-46.

d. *Retained profits of other organizations.* See CIA, *GNP 1970*, p. 46.

2. *Charges to economic enterprises for special funds*

a. *Social insurance and social security.* See CIA, *GNP 1970*, p. 46.

b. *Education.* See CIA, *GNP 1970*, p. 46.

c. *Research.* See CIA, *GNP 1970*, p. 46.

d. *Social-cultural and sports activities.* This item (0.162 billion rubles), estimated as 0.15 percent of total wages of *khozraschet* enterprises, represents funds paid to trade unions for support of social-cultural and sports activities. A proxy for the total wages of *khozraschet* enterprises is the total state wage bill (table D-1, item 1) less the wages in health, education, government administrative services, and part of science (the latter taken at half the state budget allocation for science, net of investment). The wage bills of these sectors are shown in table D-8, column 7.

e. *Militarized guards.* This item (0.880 billion rubles) is estimated at half of total current outlays on civilian police (table D-4, item 2,d,[3]). It represents charges to enterprise costs that are known to be incurred for the support of the militarized guard. It is thought that a substantial share of such police are used to guard state reserves and prisoners working on contract in ordinary productive enterprises.

f. *Administrative expenses of higher echelons.* This item (1.065 billion rubles) is estimated at 30.8 percent of total current outlays on state administration, the estimated share of employment in economic administration (trusts, offices, and others) in total state administration employment. The share was extrapolated to 1970 on the basis of its growth between 1960 (24.0 percent) and 1967 (28.6 percent—*Trud v SSSR*, p. 29). This item is intended to represent the charge to costs of *khozraschet* enterprises for "support of higher echelons," a standard item in enterprise accounts. Outlays on state administration (3.458 billion rubles) are calculated at 90.5 percent of outlays on state administration and social organizations (3.821 billion rubles—table D-4, item 2,c). This share is derived in CIA, *GNP 1970*, p. 54.

3.*Taxes and other payments to the budget*

a. *Tax on income of collective farms.* See CIA, *GNP 1970*, p. 46.

b. *Tax on income of consumer cooperatives.* See CIA, *GNP 1970*, p. 46.

c. *Tax on income of other organizations.* See CIA, *GNP 1970*, p. 46.

d. *Deductions from profits of state enterprises.* See CIA, *GNP 1970*, p. 46.

e. *Turnover tax.* See *Gosbyudzhet 1972*, p. 17.

f. *Miscellaneous charges.* The estimate of this item is substantially revised from the method described in CIA, *GNP 1970*, p. 47. In concept, this item still represents the share of unidentified budgetary income which is received from current production activity plus several miscellaneous identified incomes. *Gosbyudzhet 1972* gives total revenues from the socialist sector and identifies several components (pp. 11-12), leaving a large residual:

	Billion Rubles
Total income from the socialist sector	142.8587
Less:	
Turnover taxes	49.3798
Payments of state enterprises and other economic organizations from profits	54.1568
Income taxes from *kolkhozy* and social organizations	1.2344
Social insurance charges	8.2034
Forestry income	0.4924
Equals:	
Residual	29.3919

Several other income items, which can be estimated or identified from other parts of *Gosbyudzhet 1972* or from other sources, reduce this residual substantially:

	Billion Rubles
Residual	29.3919
Less:	
Local fees from enterprises	0.4588
Rental income	0.0626
Income from reduction of administrative expenses	1.7000
Republic budget surplus	1.2548
Increase in the supply of money	2.0000
Income from foreign trade	7.5810
Parents' fees for kindergartens	0.7348
Parents' fees for nurseries	0.0835
Price markups on radio and television sets	0.5100
Surcharges on spare parts for agricultural machinery	0.7500
Equals:	
Revised residual	14.2564

The estimates of income from reduction of administrative expenses and the increase in the supply of money are taken from Igor Birman, *Secret Incomes of the Soviet State Budget*, The Hague, Martinus Nijhoff Publishers, 1981, pp. 82 and 202. The estimate of surcharges on spare parts for agricultural machinery is derived from the estimate for 1972 in Vladimir G. Treml, *Agricultural Subsidies in the Soviet Union*, p. 28, and the indication that the 1970 and 1972 values were virtually identical (Vladimir G. Treml, *Price Indexes for Soviet 18-Sector Input-Output Tables for 1959-1975*, Arlington, Va., SRI International, 1978, p. 96). The estimate of income from foreign trade is derived as the sum of the differences in the prices of exports and imports in domestic and foreign trade prices. Estimates of exports and imports in domestic prices are from Vladimir G. Treml, and Barry L. Kostinsky, *The Domestic Value of Soviet Foreign Trade: Exports and Imports in the 1972 Input-Output Table*, US Department of Commerce, Bureau of the Census, Foreign Economic Report No. 20, Washington, D. C., forthcoming. Exports and imports in foreign trade prices are in *Narkhoz 1972*, p. 737.

The revised residual may include income from such sources as: custom duties, gross receipts of budget organizations, miscellaneous levies and nontax revenues, unspent budget allocations, fines, deductions for the road economy, and possibly bank loans to the budget equivalent to the increase in savings deposits of the population. In the absence of information on the content of the revised residual, we assume that 90 percent (12.8303 billion rubles) represents income derived from current production of goods and services.

Table D-3 (Continued)

Sources to this table (Continued):

Total miscellaneous charges are then computed as the unidentified current income just derived plus those items enumerated in the derivation of the residual that represent current income and are not included elsewhere:

	Billion Rubles
90 percent of revised budget income residual	12.8308
Plus:	
Price markups on radio and television sets	0.5100
Forestry income	0.4924
Local fees from enterprises	0.4588
Rental income	0.0626
Income from reduction of administrative expenses	1.7000
Surcharges on spare parts for agricultural machinery	0.7500
Income from foreign trade	7.5810
Equals:	
Miscellaneous charges	24.3856

4. *Allowance for subsidized losses*. There have been several revisions in the estimation of this item. It now consists of the following subsidies:

	Billion Rubles
Total subsidies	22.553
Price differences on the procurement of agricultural products by industry	13.580
Payments from gross turnover taxes	3.966
Payments from the budget to cover price reductions in retail trade	0.400
Processed feeds	0.475
Fertilizer	0.365
Agricultural machinery and equipment	0.432
Housing	2.086
Budget allocations to the press	0 120
Art and radiobroadcasting	0.628
Recreation	0.501

Price differences on the procurement of agricultural products by industry are from CIA, *GNP 1970*, p. 49, except that a subsidy to milk products of 0.750 billion rubles has been deducted because it is now known to be netted against profits (*Izvestiya akademii nauk, seriya ekonomicheskaya*, No. 5, 1975, p. 67 and Vladimir G. Treml, *Agricultural Subsidies in the Soviet Union*, p. 24).

Payments from gross turnover taxes are the difference between gross and net turnover taxes (*Gosbyudzhet 1972*, pp. 11 and 14). The subsidies for processed feeds, fertilizer, and agricultural machinery and equipment are from Vladimir G. Treml, *Price Indexes for Soviet 18-Sector Input-Output Tables, 1959-1975*, p. 96.

All other subsidies are from CIA, *GNP 1970*, p. 48. Budgetary outlays on physical culture (0.047 billion rubles) were treated as a subsidy in CIA, *GNP 1970*. They are now classified as a component of public- sector outlays on physical culture.

5.*Consolidated total charges against product, net of depreciation*. This was derived as the sum of items 1 through 4.

6. *Depreciation*. See CIA, *GNP 1970*, p. 49.

7. *Consolodated charges against current product*. This was derived as the sum of items 5 and 6.

8. *Transfer receipts*. See Table D-2, item 7.

9. *Consolidated net income*. This was derived as the sum of items 7 and 8.

Table D-4

Billion Rubles

Soviet Public-Sector Outlays, 1970

1. Communal services	21.268
a. Education	12.939
b. Health	8.268
c. Physical culture	0.061
2. Government administrative services	9.030
a. General agricultural programs	1.004
b. Forestry	0.636
c. State administration and the administrative organs of social organizations	3.821
d. Municipal and related services	3.569
(1) Culture	1.180
(2) Municipal services	0.628
(3) Civilian police	1.761
3. Gross investment	122.143
a. Fixed capital	106.989
(1) New fixed investment	87.989
(a) Machinery and equipment	26.053
(b) Construction and other capital outlays	58.164
(c) Net additions to livestock	3.772
(2) Capital repair	19.000
b. Inventories	15.154
4. Research and development	10.343
5. Outlays n.e.c.	28.429
a. Net exports	0.961
b. Defense n.e.c., unidentified outlays, and statistical discrepancy	27.468
6. Consolidated total value of goods and services, exclusive of sales to households	191.213
7. Transfer outlays	24.628
a. Pensions and allowances	22.300
b. Stipends	1.300
c. Interest payments to households	1.035
d. Net new bank loans to households	−0.034
e. Profits distributed to consumer cooperative members	0.027
8. Consolidated total outlays	215.841

Sources to this table

1. *Communal services*

a. *Education.* Public-sector outlays on education are estimated at 12.939 billion rubles: the sum of wages (9.400 billion rubles), social insurance (0.517 billion rubles), and other current outlays (3.993 billion rubles), less parents' fees for education (0.971 billion rubles).

Wages are derived from reported employment (7.246 million—*Narkhoz 1978*, p. 366) and the average wage rate (108.1 rubles per month—Ibid, p. 373). Social insurance is calculated as 5.5 percent of the wage bill (CIA, *GNP 1970*, p. 52).

The method of estimating other current outlays is complicated and set out in full in the description of the end-use education index (JEC, *Consumption*). Only a summary is given here. Budgetary education expenditures are divided between general education and higher education (*Gosbyudzhet 1972*, pp. 27-28). The budget handbooks provide additional details on certain educational subcategories of these two expenditure categories (for example, primary and secondary schools—Ibid, pp. 84-94) for the republic budgets only. Included are such items as wages, social insurance, stipends, and investment in equipment. For each of these educational subcategories, other (nonlabor) current outlays and total current outlays are computed. Then both items are summed for general and higher education and the percentage of other current outlays in total current outlays is computed. Finally, total budgetary expenditures for the USSR for the two categories are multiplied by the percentage of other current outlays and the results summed to arrive at total other current outlays. Parents' fees for education are derived in CIA, *GNP 1970*, p. 42.

b. *Health.* Outlays for health are estimated at 8.268 billion rubles: the sum of wages (5.004 billion rubles), social insurance (0.275 billion rubles), and other current outlays (3.084 billion rubles), less parents' fees for health (0.095 billion rubles). These components are estimated jointly with expenditures on physical culture (item 1.c below) in the following tabulation:

Outlays on Health and Physical Culture

Billion Rubles

	Total	Physical Culture	Health
Wages and social insurance	5.916	0.637	5.279
Wages	5.608	0.604	5.004
Social insurance	0.308	0.033	0.275
Other current outlays from the budget	3.106	0.022	3.084
Other current outlays from other sources	0.350	0.350	
Subsidy	−0.501	−0.501	
Parents' fees	−0.542	−0.447	−0.095
Total	**8.329**	**0.061**	**8.268**

Total wages in health and physical culture are derived from reported employment in health, which includes physical culture (5.080 million—*Narkhoz 1978*, p. 366), and the average wage rate (92.0 rubles per month—Ibid, p. 373). Total social insurance is calculated as 5.5 percent of the wage bill (CIA, *GNP 1970*, p. 53). It

Table D-4 (Continued)

Sources to this table (Continued):

was assumed that the shares of other (nonlabor) current outlays in total expenditures were the same in both health and physical culture. The estimate resulting from this assumption is that other current expenditures are 36.9 percent of total expenditures.

Total expenditures on physical culture are estimated at 1.009 billion rubles, the sum of public-sector outlays (0.061 billion rubles—item 1,c below), the subsidy for recreation (0.501 billion rubles—table D-3, item 4), and household expenditures for passes to resorts and the like (0.447 billion rubles—CIA, *GNP 1970*, p. 42). Other current outlays are 36.9 percent, or 0.372 billion rubles of total expenditures. Of this total, 0.022 billion rubles represent budgetary expenditures. Wages and social security payments in physical culture are then determined as total outlays less other current outlays, or 0.637 billion rubles. This in turn determines wages and social insurance in health as 5.279 billion rubles (5.916 billion rubles in health and physical culture less 0.637 billion rubles in physical culture).

Finally, other current outlays from the budget are determined as they were for education. Other current outlays are computed as a percentage of total current outlays for identified republic budgetary expenditures and then multiplied by total budgetary health expenditures. The result is an estimate of other current outlays in health and physical culture of 3.106 billion rubles. Subtracting the estimated outlays of physical culture of 0.022 billion rubles produces outlays on health alone of 3.084 billion rubles.

c. *Physical culture*. Public-sector outlays on physical culture are 0.061 billion rubles, the sum of budgetary expenditures (0.047 billion rubles—*Narkhoz 1970*, p. 734) and other expenditures (0.014 billion rubles). V. Cao-Pinna and S. S. Shatalin published a value for 1969 of public-sector outlays of 0.053 billion rubles (*Consumption Expenditures in Eastern and Western Europe*, New York, Pergamon Press, 1979, p. 116). Budgetary outlays in 1969 were 0.041 billion rubles (*Narkhoz 1970*, p. 734). Assuming the relationship between budgetary and other expenditures in 1969 is the same in 1970, then total outlays in 1970 are:

$(0.047) \times (0.053/0.041) = 0.061$ billion rubles.

2. *Government Administrative Services*

a. *General agricultural programs*. This item is the sum of wages (0.721 billion rubles), social insurance deductions (0.032 billion rubles), and other current outlays (0.251 billion rubles). Wages are derived from employment (0.586 million) and the average wage rate (102.5 rubles per month). Employment is determined as the difference between total state agricultural employment (9.419 million—*Narkhoz 1978*, p. 366) and employment in state farms and other state enterprises (8.833 million—Ibid). The wage rate is determined from the difference in the wage rates for total state agriculture (101.0 rubles per month—Ibid, p. 372) and state farms and other state organizations (100.9 rubles per month—Ibid). The following tabulation shows the calculation:

	Employment (million people)	Wage Rate (rubles per month)	Monthly Wages (billion rubles)
Total state agriculture	9.419	101.0	0.951
State farms and other state enterprises	8.833	100.9	0.891
General agricultural programs	0.586	102.5	0.060

Social insurance deductions are derived as 4.4 percent of wages (CIA, *GNP 1970*, p. 53). Other current outlays are estimated as one-fourth of current outlays, a reduction from the one-third used in CIA, *GNP 1970* (p. 53) for government administrative services. The lower share is based on fragmentary evidence that labor costs comprise the vast bulk of outlays on these government services. The share would be lower than in education (31 percent—item 1,a above) and health (37 percent—item 1,b above), where food costs are large.

b. *Forestry*. Total outlays are estimated as 0.636 billion rubles: the sum of wages (0.457 billion rubles), social insurance deductions (0.020 billion rubles), and other current outlays (0.159 billion rubles). Wages are derived from employment (0.433 million—*Narkhoz 1978*, p. 366) and the average wage rate (88 rubles per month). The wage rate, not published in the *Narkhoz*, is from G. I. Vorob'ev et al (*Lesnoye khozyaystvo SSSR*, Moscow, Lesnaya Promyshlennost', 1977, p. 331). Social insurance deductions are calculated at 4.4 percent of wages (CIA, *GNP 1970*, p. 53). Other current outlays are estimated to be one-fourth of total current outlays.

c. *State administration and the administrative organs of social organizations*. This item is a combination of two sectors in CIA, *GNP 1970*: (1) state administration, and (2) the administrative organs of social organizations. The separation of the two sectors in CIA, *GNP 1970* was somewhat arbitrary, and we used the same man-hour employment index to measure changes in the activity level of both sectors. It was decided therefore to use one combined sector in this report.

Total outlays are estimated at 3.821 billion rubles—the sum of wages (2.717 billion rubles), social insurance deductions (0.149 billion rubles), and other current outlays (0.955 billion rubles). Wages are derived from employment (1.838 million—*Narkhoz 1978*, p. 366) and the average wage rate (123.2 rubles per month—Ibid, p. 372). Social insurance deductions are calculated at 5.5 percent of the wage bill (CIA, *GNP 1970*, p. 54). Other current outlays are assumed to be one-fourth of total current outlays.

d. *Municipal and related services.* (1) *Culture* outlays are estimated at 1.180 billion rubles—the sum of wages (0.839 billion rubles), social insurance deductions (0.046 billion rubles), and other current outlays (0.295 billion rubles). The wage bill is derived from employment (0.824 million—*Narkhoz 1978*, p. 366) and the average wage rate (84.8 rubles per month—Ibid, p. 372). Social insurance deductions are calculated at 5.5 percent of the wage bill (CIA, *GNP 1970*, p. 52). Other current outlays are assumed to be one-fourth of total current outlays.

(2) *Municipal services* are estimated at 0.628 billion rubles—the sum of wages (0.450 billion rubles), social insurance deductions (0.021 billion rubles), and other current outlays (0.157 billion rubles). The wage bill is derived from employment (0.397 million) and the average wage rate (94.5 rubles per month). Employment is derived as 13 percent of the employment of the housing-communal economy (3.052 million—*Narkhoz 1978*, p. 366). The wage rate is assumed to be equal to that of the total housing-communal sector (Ibid, p. 373). Social insurance deductions are calculated as 4.7 percent of the wage bill (CIA, *GNP 1970*, p. 54). Other current outlays are assumed to be one-fourth of total current outlays.

(3) *Civilian police* outlays are estimated as 1.761 billion rubles—the sum of wages (1.235 billion rubles), social insurance deductions (0.086 billion rubles), and other current outlays (0.440 billion rubles). The wage bill is derived from employment (0.675 million) and an estimated wage rate (152.5 rubles per month). Employment is estimated to be 67.6 percent of the *Narkhoz* employment category "other branches of material production" (0.998 million—*Narkhoz 1978*, p. 366). The wage rate is assumed to be 25 percent above the average wage rate of all state workers and employees (122.0 rubles per month—Ibid). This assumption results from the calculation of the implicit wage rate for the forestry and other branches of material production sectors, the two sectors for which wage data are not published in the *Narkhoz*. This type of calculation is subject to rounding errors, but a study of several years shows that the implicit wage rate is consistently higher than the average for all state workers and employees.

Social insurance deductions are assumed to be 7.0 percent of the wage bill. Other current outlays are assumed to be one-fourth of total current outlays.

3.Gross Investment

a. *Fixed capital.* (1) *Machinery and equipment* is estimated at 26.053 billion rubles: the sum of new fixed investment in machinery and equipment (25.300 billion rubles), changes in warehouse stocks of equipment requiring installation (-0.137 billion rubles), and the acquisition of equipment by budget institutions (0.890 billion rubles). New fixed investment is reported in *Narkhoz 1972*, (p. 474) as the "equipment, instruments, and inventory," component of capital investment. This value is said to be in 1969 estimate prices. How those prices compare to 1970 prices is uncertain. The wholesale price index for the output of the machine-building and metalworking branch of industry shows no change in 1970 compared with 1969. Western studies have suggested that there is a persistent upward trend in price, but no precise estimates of yearly changes are available. Here it is assumed that there was no change between 1969 estimate prices and 1970 expenditures.

The change in warehouse stocks of equipment requiring installation is from CIA, *GNP 1970*, p. 55. The acquisition of equipment by budget-supported institutions is not included in Soviet investment data. This value was estimated by increasing the reported value for outlays by union-republic budgets (0.6506 billion rubles—*Gosbyudzhet 1972*, p. 78) to include outlays from the union budget. In 1970 union-republic budgets financed 73.1 percent of total outlays on education, culture, health, physical culture, science, and administration (Ibid, pp. 33, 34, 60, 69, and 72). It is assumed that this relationship is also true for the acquisition of equipment.

(2) *Construction and other capital outlays* are estimated as the difference between total expenditures on construction and other capital outlays (59.8 billion rubles) and private expenditures on housing construction (1.636 billion rubles—table D-2, item 5,a). Total outlays on construction and other capital outlays are derived as the difference between the gross output of the construction sector (67.6 billion *Narkhoz 1978*, p. 41) and estimated expenditures on capital repair of structures (7.8 billion rubles—appendix C).

(3) *Net additions to livestock* in the public sector are derived in same manner as in the private sector (table D-1, item 2,c,[2]). The calculation is shown below.

Valuation of the Net Additions
to Public-Sector Livestock
Inventories, 1970

	(1)	(2)	(3)	(4)	(5)
	Inventory of Animals (thousand head)		Net Additions to Livestock Inventories		
	End 1969	End 1970	Thousand Head	Rubles Per Head	Billion Rubles
Cattle	70,173	74,272	4,099	442	1.812
Hogs	42,225	50,921	8,696	173	1.504
Sheep and goats	104,138	110,241	6,103	37	0.226
Poultry	230,213	276,192	45,979	5	0.230
Total					**3.772**

Table D-4 (Continued)

Sources to this table (Continued):

Sources: All data are from CIA, *GNP 1970*, p. 57, except for poultry. The poultry inventory data are from *Selkhoz 1971*, p. 273. The poultry price is derived by Margaret Hughes and Barbara Severin in JEC, *Agriculture*, p. 51.

(4) *Capital repair* is derived as the sum of collective-farm outlays (0.918 billion rubles), amortization deductions for capital repair (14.663 billion rubles), and budget expenditures for capital repair (3.419 billion rubles). The collective-farm outlays are from CIA, *GNP 1970*, p. 55. The amortization deductions are from *Narkhoz 1978*, p. 532. The budget expenditures reported for union-republic budgets (2.4993 billion rubles—*Gosbyudzhet 1972*, p. 81) are assumed to represent 73.1 percent of total budget-financed capital repair expenditures, the same share as used in the derivation of the acquisition of equipment by budget-supported institutions in item 3,a,(1) above.

b. *Inventories.* See CIA, *GNP 1970*, p. 55.

4. *Research and development.* This item is derived as the sum of wages (5.020 billion rubles), social insurance deductions (0.276 billion rubles), depreciation (0.165 billion rubles), profits (0.094 billion rubles), charges for special funds (0.325 billion rubles), and material expenditures (4.463 billion rubles). The wage bill is derived from employment (2.999 million—*Narkhoz 1978*, p. 366) and the average wage rate (139.5 rubles per month—Ibid, p. 373). Social insurance deductions are calculated as 5.5 percent of the wage bill (CIA, *GNP 1970*, p. 56). Depreciation, profits, and charges for special funds are estimated in table D-9. Material expenditures are estimated in the same manner, as the corresponding component of the research and development index (appendix B, table B-18).

5. *Outlays n.e.c.*

a. *Net exports.* This was derived as the difference between total exports and total imports valued in foreign trade prices (*Narkhoz 1978*, p. 547).

b. *Defense n.e.c., unidentified outlays, and statistical discrepancy.* This was derived as the difference between total outlays (item 8) and the sum of items 1 through 4; 5,a; and 7.

6. *Consolidated total value of goods and services exclusive of sales to households.* This was derived as the sum of items 1 through 5.

7. *Transfer outlays.* See table D-1, item 8.

8. *Consolidated total outlays.* These are equal to total incomes, table D-3, item 9.

Table D-5 Billion Rubles

Soviet Gross National Product in Established Prices by End Use, 1970

1. Consumption	211.083
a. Goods	166.478
(1) Food	107.926
(2) Soft goods	44.294
(3) Durables	14.258
b. Services	44.605
(1) Housing	3.429
(2) Utilities	3.478
(3) Transportation	5.400
(4) Communications	1.200
(5) Repair and personal care	5.497
(6) Recreation	2.608
(7) Education	14.380
(8) Health	8.613
2. Investment	124.374
a. New fixed investment	90.220
(1) Machinery and equipment	26.053
(2) Construction and other capital outlays	59.800
(3) Net additions to livestock	4.367
b. Capital repair	19.000
c. Inventories	15.154
3. Other public-sector expenditures	47.802
a. Government administrative services	9.030
(1) General agricultural programs	1.004
(2) Forestry	0.636
(3) State administration and the administrative organs of social organizations	3.821
(4) Municipal and related services	3.569
(a) Culture	1.180
(b) Municipal services	0.628
(c) Civilian police	1.761
b. Research and development	10.343
c. Outlays n.e.c.	28.429
(1) Net exports	0.961
(2) Defense n.e.c., unidentified outlays, and statistical discrepancy	27.468
4. Gross national product	383.259

Sources to this table:

1. *Consumption*

a. *Goods*

(1) ***Food*** is the sum of items 1,a,(1); 1,b,(1); 3,a,(1); and 3,b,(1) in table D-2.

(2) ***Soft goods*** is the sum of items 1,a,(2); 1,b,(2); 3,a,(2); and 3,b,(2) of table D-2.

(3) ***Durables***. See table D-2, item 1,a,(3).

b. ***Services***

(1) ***Housing***. See table D-2, item 2,a.

(2) ***Utilities***. See table D-2, item 2,b,(1).

(3) ***Transportation***. See table D-2, item 2,b,(2).

(4) ***Communications***. See table D-2, item 2,b,(3).

(5) ***Repair and personal care***. See table D-2, item 2,b,(4).

(6) ***Recreation***. See table D-2, item 2,b,(5); and table D-4, item 1,c.

(7) ***Education***. See table D-2, item 2,b,(6); and table D-4, item 1,a.

(8) ***Health***. See table D-2, item 2,b,(7); and table D-4, item 1,b.

2. ***Investment***

a. *New fixed investment*

(1) ***Machinery and equipment***. See table D-4, item 3,a,(1),(a).

(2) ***Construction and other capital outlays***. See table D-2, item 5,a; and table D-4, item 3,a,(1),(b).

(3) ***Net additions to livestock***. See table D-2, item 5,b; and table D-4, item 3,a,(1),(c).

b. ***Capital repair***. See table D-4, item 3,a,(2).

c. ***Inventories***. See table D-4, item 3,b.

3. ***Other public-sector expenditures***

a. ***Government administrative services***. See table D-4, item 2.

b. ***Research and development***. See table D-4, item 4.

c. *Outlays n.e.c.* See table D-4, item 5.

4. *Gross national product*. This is the sum of items 1 through 3.

Table D-6 Billion Rubles

Soviet Gross National Product in Established Prices by Type of Income, 1970

1. Wage bill	135.412
a. State wages and salaries	132.032
b. Military pay and allowances	3.380
2. Other and imputed income	62.251
a. Net income of households from agriculture	41.709
b. Military subsistence	3.200
c. Other money income currently earned and statistical discrepancy	10.598
d. Imputed net rent	1.080
e. Imputed value of owner-supplied construction services	0.579
f. Charges to economic enterprises for special funds	5.085
(1) Education	0.400
(2) Research	2.578
(3) Social-cultural measures and sports activities	0.162
(4) Militarized guards	0.880
(5) Support for administration of higher echelons	1.065
3. Social insurance	9.436
4. Profits	89.154
a. State enterprises	79.591
(1) Retained profits of state enterprises	26.481
(2) Deductions from profits of state enterprises	53.110
b. Collective farms	7.852
(1) Retained income of collective farms	7.186
(2) Tax on income of collective farms	0.666
c. Consumer cooperatives	1.283
(1) Retained profits of consumer cooperatives	0.821
(2) Tax on income of consumer cooperatives	0.462
d. Other organizations	0.428
(1) Retained profits of other organizations	0.321
(2) Tax on income of other organizations	0.107
5. Depreciation	31.827
6. Turnover and other indirect taxes	77.732
a. Turnover taxes	53.346
b. Miscellaneous charges	24.386
7. Allowances for subsidized losses n.e.c.	−22.553
8. Gross national product	383.259

Sources to this table:

1. *Wage Bill*

a. *State wages and salaries*. See table D-1, item 1.

b. *Military pay and subsistence*. See table D-1, item 3,a.

2. *Other and Imputed Income*

a. *Net income of households from agriculture*. See table D-1, item 2.

b. *Military subsistence*. See table D-1, item 3,b.

c. *Other money income currently earned and statistical discrepancy*. See table D-1, item 4.

d. *Imputed net rent*. See table D-1, item 5.

e. *Imputed value of owner-supplied construction services*. See table D-1, item 6.

f. *Charges to economic enterprises for special funds*. See table D-3, items 2,b; 2,c; 2,d; 2,e; and 2,f.

3. *Social insurance*. See table D-3, item 2,a.

4. *Profits*

a. *State enterprises*

(1) *Retained profits of state enterprises*. See table D-3, item 1,b.

(2) *Deductions from profits of state enterprises*. See table D-3, item 3,d.

b. *Collective farms*

(1) *Retained income of collective farms*. See table D-3, item 1,a.

(2) *Tax on income of collective farms*. See table D-3, item 3,a.

c. *Consumer cooperatives*

(1) *Retained profits of consumer cooperatives*. See table D-3, item 1,c.

(2) *Tax on income of consumer cooperatives*. See table D-3, item 3,b.

d. *Other organizations*

(1) *Retained profits of other organizations*. See table D-3, item 1,d.

(2) *Tax on income of other organizations*. See table D-3, item 3,c.

5. *Depreciation*. See table D-3, item 6.

6. *Turnover and other indirect taxes*

a. *Turnover taxes*. See table D-3, item 3,e.

b. *Miscellaneous charges*. See table D-3, item 3,f.

7. *Allowance for subsidized losses*. See table D-3, item 4.

8. *Gross national product*. This was derived as the sum of items 1 through 7.

Table D-7

Billion Rubles

Soviet Gross National Product in Established Prices by Sector of Origin, 1970

	(1) States Wage Bill	(2) Other and Imputed Income	(3) Social Insurance Deductions	(4) Depreciation	(5) Profits	(6) Turnover and Other Indirect Taxes	(7) Subsidies	(8) Total
Total	**135.412**	**62.251**	**9.436**	**31.827**	**89.154**	**77.732**	**−22.553**	**383.259**
Industry	49.535	5.275	3.571	14.893	52.385	68.861	−18.688	175.832
Ferrous metals	2.539	0.271	0.200	1.430	3.355	−0.363	0	7.432
Nonferrous metals	1.548	0.165	0.122	0.798	2.321	−0.194	0	4.760
Fuels	3.717	0.397	0.328	2.321	3.866	4.467	0	15.096
Electric power	1.065	0.114	0.070	1.602	2.476	0.663	0	5.990
Machinery	19.461	2.070	1.491	3.247	14.186	5.768	−0.432	45.791
Chemicals	2.613	0.279	0.218	1.150	3.927	2.016	−0.365	9.838
Wood, pulp, and paper	4.648	0.495	0.219	1.077	3.127	1.383	0	10.949
Construction materials	3.768	0.401	0.230	0.963	1.601	0.725	0	7.688
Light industry	5.174	0.551	0.351	0.440	6.288	25.857	−5.306	33.355
Food industry	4.185	0.446	0.283	1.291	6.899	27.224	−12.110	28.218
Other industry	0.817	0.086	0.059	0.574	4.339	1.315	−0.475	6.715
Construction	16.889	2.669	1.025	2.147	4.454	1.125	0	28.309
Agriculture	12.033	42.991	1.696	5.531	12.494	3.836	0	78.581
Transportation	10.294	1.096	0.545	5.081	10.081	1.121	0	28.218
Communications	1.545	0.164	0.082	0.383	0.790	0.107	−0.370	2.701
Trade	8.748	0.932	0.395	1.323	6.679	0.726	−0.530	18.273
Services	32.174	5.866	1.772	2.423	2.177	1.786	−2.845	43.353
Housing	1.765	2.011	0.083	1.318	0	0.194	−2.086	3.285
Utilities	0.594	0.043	0.028	0.308	0.724	0.070	0	1.767
Repair and personal care	2.277	0.998	0.146	0.193	0.376	0.165	0	4.155
Recreation	1.176	0.568	0.064	0.284	0.466	0.074	−0.759	1.873
Education	9.400	1.001	0.517	0	0	0.452	0	11.370
Health	5.004	0.533	0.275	0	0	0.241	0	6.053
Science	5.020	0.312	0.276	0.165	0.094	0.243	0	6.110
Credit and insurance	0.519	0.037	0.029	0.155	0.517	0.052	0	1.309
Government administrative services	6.419	0.363	0.354	0	0	0.295	0	7.431
General agricultural programs	0.721	0.041	0.032	0	0	0.033	0	0.827

Table D-7 (Continued) Billion Rubles

Soviet Gross National Product in Established Prices by Sector of Origin, 1970

	(1) States Wage Bill	(2) Other and Imputed Income	(3) Social Insurance Deductions	(4) Depreciation	(5) Profits	(6) Turnover and Other Indirect Taxes	(7) Subsidies	(8) Total
Forestry	0.457	0.026	0.020	0	0	0.021	0	0.524
State administration and the administrative organs of social organizations	2.717	0.154	0.149	0	0	0.124	0	3.144
Culture	0.839	0.047	0.046	0	0	0.039	0	0.971
Municipal services	0.450	0.025	0.021	0	0	0.021	0	0.517
Civilian police	1.235	0.070	0.086	0	0	0.057	0	1.448
Military personnel	3.380	3.200	0.240	0	0	0	0	6.820
Other branches	0.814	0.058	0.110	0.046	0.094	0.170	−0.120	1.172

Sources for this table:

1. *State wage bill.* See table D-8, column 7.
2. *Other and imputed income.* See table D-10, column 9.
3. *Social insurance.* See table D-11, column 7.
4. *Depreciation.* See table D-13, column 4.
5. *Profits.* See table D-15, column 7.
6. *Turnover and other indirect taxes.* See table D-16, column 6.
7. *Subsidies.* See table D-16, column 5.
8. *Gross national product.* This was derived as the sum of columns 1 through 7.

Table D-8

Billion Rubles

Distribution of the State Wage Bill by Sector of Origin, 1970

	(1) Unadjusted State Wage Bill	(2) Adjustments for:	(3)	(4)	(5)	(6)	(7) Adjusted State Wage Bill
		Repair and Personal Care	Housing-Communal Economy	Recreation	Civilian Police	Transportation	
Total	**135.412**	**0**	**0**	**0**	**0**	**0**	**135.412**
Industry	50.549	−1.728	0	0	0	0.714	49.535
Ferrous metals	2.502	0	0	0	0	0.037	2.539
Nonferrous metals	1.526	0	0	0	0	0.022	1.548
Fuels	3.663	0	0	0	0	0.054	3.717
Electric power	1.050	0	0	0	0	0.015	1.065
Machinery	19.378	−0.197	0	0	0	0.280	19.461
Chemicals	2.575	0	0	0	0	0.038	2.613
Wood, pulp, and paper	4.623	−0.042	0	0	0	0.067	4.648
Construction materials	3.714	0	0	0	0	0.054	3.768
Light industry	6.219	−1.120	0	0	0	0.075	5.174
Food industry	4.125	0	0	0	0	0.060	4.185
Other industry	1.174	−0.369	0	0	0	0.012	0.817
Construction	16.283	0	0	0	0	0.606	16.889
Agriculture	10.695	0	0	0	0	1.338	12.033
Transportation	13.099	0	0	0	0	−2.805	10.294
Communications	1.545	0	0	0	0	0	1.545
Trade	8.601	0	0	0	0	0.147	8.748
Services	29.211	1.728	0	0	1.235	0	32.174
Housing	3.461	0	−1.696	0	0	0	1.765
Utilities	0	0	0.594	0	0	0	0.594
Repair and personal care	0	1.728	0.549	0	0	0	2.277
Recreation	0.469	0	0.103	0.604	0	0	1.176
Education	9.400	0	0	0	0	0	9.400
Health	5.608	0	0	−0.604	0	0	5.004
Science	5.020	0	0	0	0	0	5.020
Credit and insurance	0.519	0	0	0	0	0	0.519
Government administrative services	4.734	0	0.450	0	1.235	0	6.419
General agricultural programs	0.721	0	0	0	0	0	0.721
Forestry	0.457	0	0	0	0	0	0.457
State administration and the administrative organs of social organizations	2.717	0	0	0	0	0	2.717
Culture	0.839	0	0	0	0	0	0.839
Municipal services	0	0	0.450	0	0	0	0.450
Civilian police	0	0	0	0	1.235	0	1.235
Military personnel	3.380	0	0	0	0	0	3.380
Other branches	2.049	0	0	0	1.235	0	0.814

Table D-8 (Continued)

Distribution of the State Wage Bill by Sector of Origin, 1970

Sources to this table

1. *Unadjusted state wage bill.* The total state wage bill is derived in table D-6, item 1, as the sum of state wages and salaries (132.032 billion rubles) and military pay and allowances (3.380 billion rubles). The services and government administrative services line items are derived as the sum of their parts. The military personnel line item is from table D-6, item 1,b. All other line items are from table D-9, column 3. The line items in table D-9 are the Soviet employment categories, while those in this table are our GNP sectors. The data from table D-9 are placed in the GNP sectors in this table which contain most of the wages. Columns 2-6 reallocate wages from the Soviet categories to conform with the definitions of our GNP sectors.

2. *Repair and personal care.* The Soviets consider the repair and custom production of consumer goods to be part of the productive sphere and include the employees engaged in these activities with the corresponding branches of industry. In order to estimate the value added in these services, we reallocate the wages from industry to the repair and personal care sector. Employment in these services, given in *Vestnik statistiki* (no. 8, 1973), p. 95, is assumed to be located in the following industrial branches in the Soviet employment data:

Soviet Employment Category	Type of Service	Employment (thousands)
Total		1,299
Machinery	Repair of durables	122
Wood, pulp, and paper	Furniture repair	26
Light industry	Shoe repair	138
	Repair and tailoring of clothing	709
	Repair of knitwear	57
Other industry	Dry cleaning	37
	Laundries	66
	Photo services	51
	Other services	93

In the absence of wage data for these services, it is assumed that the average monthly wage in each service is the same as the average monthly wage in its corresponding branch of industry. The wage rates are shown in table D-9, column 2.

3. *Housing-communal economy.* Employment in the housing-communal economy category of the Soviet employment data belong to the housing, repair and personal care, utilities, recreation, and municipal services sectors of our GNP accounts. The distribution of these employees is estimated to be:

	Employment (thousands)
Housing-communal economy	3,052
Housing	1,557
Municipal services	397
Recreation (hotels)	91
Repair and personal care	484
Utilities	523

Employment in the housing and in municipal services are estimated at 51 and 13 percent, respectively, of total housing-communal employment (CIA, *GNP 1970*, pp. 54 and 75). Hotel employment is from CIA, *GNP 1970*, p. 42. Repair and personal care employment is derived as total repair and personal care employment (1,869,000—*Vestnik statistiki*, No. 8, 1973, p. 95) less employment in industrial repair and personal care services (1,299,000, item 2 above) and less employment in repair and construction of housing (86,000—Ibid). Utilities employment is derived as a residual. It is assumed that the average monthly wage rate for each employment group is 94.5 rubles, the average for the entire housing-communal economy category (table D-9, column 2).

4. *Recreation.* The Soviet health category in table D-9 includes physical culture employment at resorts and sanatoriums, which are primarily used as vacation spots. Their wages are derived in table D-4, item 1,b.

5. *Civilian police.* It is thought that employment in the other branches of material production category in table D-9 includes militarized guards and civilian police. Their wages, which are derived in table D-4, item 2,d,(3), are reallocated here to the civilian police sector.

6. *Transportation.* Employment in transportation in table D-9 includes many employees in trucking organizations that are subordinate to enterprises in other sectors of the economy. This activity is equivalent to force-account trucking in the United States, and the employees involved are included in the various nontransportation sectors in US statistics. The primary activities in the Soviet Union are delivery of construction materials, conveying agricultural produce, and short-haul delivery of industrial goods.

Using data from the 1966 and 1972 I-O tables and various sources on the different transportation modes, it is estimated that 1.666 million employees were engaged in this type of work in 1970. This employment is reallocated to other sectors according to ton-kilometer data for this type of trucking given in *Transport i svyaz'*, Moscow, Statistika, 1972, p. 221, as shown in the following tabulation:

Sector	Billion Ton-Kilometers	Percent	Employment (million persons)
Total		100.0	1.666
Industry	33.1	25.5	0.424
Construction	28.1	21.6	0.360
Agriculture	62.0	47.7	0.795
Trade	6.8	5.2	0.087

The average monthly wage for these employees is assumed to be 140.3 rubles, the rate given in *Narkhoz 1979*, p. 395, for the transportation subcategory which includes this type of activity. Within industry, these wages are allocated proportionally to the wage bill of each branch of industry.

7. *Adjusted state wage bill.* This was derived as the sum of columns 1 through 6.

Table D-9

State Wages and Salaries, 1970

	(1) Average Annual Employment (million persons)	(2) Average Monthly Wage (rubles)	(3) State Wage Bill (billion rubles)
Total	**90.186**	**122.0**	**132.032**
Industry	31.593	133.3	50.549
Ferrous metals	1.359	153.4	2.502
Nonferrous metals	0.663	191.8	1.526
Fuels	1.542	198.0	3.663
Electric power	0.633	138.2	1.050
Machinery	12.017	134.4	19.378
Chemicals	1.568	136.9	2.575
Wood, pulp, and paper	2.848	135.3	4.623
Construction materials	2.258	137.1	3.714
Light industry	5.019	103.3	6.219
Food industry	2.901	118.5	4.125
Other industry	0.785	124.6	1.174
Construction	9.052	149.9	16.283
Agriculture	8.833	100.9	10.695
Transportation	7.985	136.7	13.099
Communications	1.330	96.8	1.545
Trade	7.537	95.1	8.601
Other branches of material production	0.998	171.1	2.049
Housing-communal economy	3.052	94.5	3.461
Art	0.412	94.8	0.469
Education	7.246	108.1	9.400
Health	5.080	92.0	5.608
Science	2.999	139.5	5.020
Credit and insurance	0.388	111.4	0.519
General agricultural programs	0.586	102.5	0.721
Forestry	0.433	88.0	0.457
State administration and the administrative organs of social organizations	1.838	123.2	2.717
Culture	0.824	84.8	0.839

Table D-9 (Continued)

Sources to this table:

1. *Average annual employment.* All employment data are from *Narkhoz 1979*, pp. 387-388, except for the branches of industry and for general agricultural programs. Employment in the branches of industry are from *Vestnik statistiki*, No. 11, 1972, p. 93, except for the nonferrous metals and other industry branches. Employment in nonferrous metals is from Steven Rapawy, *Civilian Employment in the U.S.S.R.*, p. 4. Employment in other industry is derived as a residual. Employment in general agricultural programs is derived as the difference between total reported employment in state agriculture and employment in "state farms, interfarm economic enterprises, subsidiary and other productive agricultural enterprises" (table D-4, item 2,a).

2. *Average monthly wage.* All average monthly wage rates are from *Narkhoz 1979*, pp. 394-395, except for the branches of industry, other branches of material production, general agricultural programs, and forestry. The average monthly wage rates in the branches of industry, except for nonferrous metals, and other branches of material production, are determined as the state wage bill in column 3 divided by 12 times the employment in column 1. It is assumed that the average monthly wage in nonferrous metals is 25 percent higher than that in ferrous metals, based on evidence from the 1959 and 1966 I-O tables. The wage rates for general agricultural programs and forestry are from table D-4, items 2,a and 2,b.

3. *State wage bill.* The wage bill in total industry and in each branch of industry is from Vestnik statistiki, No. 11, 1972, p. 94, except for the fuels, nonferrous metals, and other industry branches. The wage bill in nonferrous metals is derived as 12 times the product of the employment in column 1 and the average wage rate in column 2. The wage bill in the fuels sector is determined from relationships among the fuel sectors in the 1972 I-O table. The calculations are shown in the following tabulation:

Employment and Wage Data From the 1972 Input-Output Table

	(1) Employment (thousands)	(2) Total Wages (million rubles)	(3) Average Wages per Employee (rubles)	(4) Column 3 as a Percent of Wages in the Coal Sector (percent)
Coal	1,001.2	3,118.0	3,114	100.0
Oil extraction	94.3	191.4	2,030	65.2
Oil refining	117.2	229.3	1,956	62.8
Gas	21.3	42.2	1,981	63.6
Other fuels	94.1	136.2	1,447	46.5
Peat	74.4	108.1	1,453	46.7
Oil shales	19.7	28.1	1,426	45.8
Total	1,328.1	3,717.1	2,799	89.9

1970 Employment, Wage, and Social Security Data

	(5) Average Wages per Employee (rubles)	(6) Employment (thousands)	(7) Total Wages (million rubles)	(8) Social Insurance Rate (percent)	(9) Social Insurance Deductions (million rubles)
Coal	2,682	1,120	3,004	9.0	270
Oil extraction	1,749	118	206	8.4	17
Oil refining	1,684	132	222	8.4	19
Gas	1,706	36	61	8.4	5
Other fuels	1,247	136	170	8.4	14
Total	2,375	1,542	3,663	8.9	325

All data in columns 1 and 2 are from the 1972 I-O table. Column 3 is calculated as column 2 divided by column 1. Column 4 is calculated as column 3 divided by the average annual wage in the coal sector (3,114 rubles—column 3). The average annual wage rate in 1970 in the coal sector (column 5) is calculated as column 7 divided by column 6. All other data in column 5 are calculated as column 4 times the average annual wages in the coal sector in 1970. All data in column 6, except for other fuels, are from Rapawy, *Civilian Employment in the U.S.S.R.*, p. 4. Employment in other fuels is calculated as a residual. All data in column 7, except for coal, are calculated as column 5 times column 6. The coal entry in column 7 is from *Vestnik statistiki*, No. 11, 1972, p. 94. The social insurance rates in column 8 for coal, oil extraction, oil refining, and gas are from CIA, *GNP 1970*, p. 72. It is assumed that the rate for other fuels is 8.4 percent. The data in column 9 are derived as column 7 times column 8.

The wage bill in other industry is derived as a residual. The wage bills in all nonindustry sectors are derived as column 1 times column 2 times 12, except for other branches of material production, which is derived as a residual.

Table D-10 Billion Rubles

Distribution of Other and Imputed Income by Sector of Origin, 1970

	(1) State Wage Bill	(2) Social-Cultural and Sports Activities	(3) Militarized Guards	(4) Administrative Expenses of Higher Echelons	(5) Education	(6) Research	(7) Other Identified Incomes	(8) Unidentified Money Income	(9) Total
Total	**135.412**	**0.162**	**0.880**	**1.065**	**0.400**	**2.578**	**49.702**	**7.464**	**62.251**
Industry	49.535	0.075	0.440	0.488	0.183	1.289	0	2.800	5.275
Ferrous metals	2.539	0.004	0.023	0.025	0.009	0.066	0	0.144	0.271
Nonferrous metals	1.548	0.002	0.014	0.015	0.006	0.040	0	0.088	0.165
Fuels	3.717	0.006	0.033	0.037	0.014	0.097	0	0.210	0.397
Electric power	1.065	0.002	0.009	0.011	0.004	0.028	0	0.060	0.114
Machinery	19.461	0.029	0.174	0.191	0.071	0.506	0	1.099	2.070
Chemicals	2.613	0.004	0.023	0.026	0.010	0.068	0	0.148	0.279
Wood, pulp, and paper	4.648	0.007	0.041	0.046	0.017	0.121	0	0.263	0.495
Construction materials	3.768	0.006	0.033	0.037	0.014	0.098	0	0.213	0.401
Light industry	5.174	0.008	0.046	0.051	0.019	0.135	0	0.292	0.551
Food industry	4.185	0.006	0.037	0.041	0.016	0.109	0	0.237	0.446
Other industry	0.817	0.001	0.007	0.008	0.003	0.021	0	0.046	0.086
Construction	16.889	0.025	0.150	0.167	0.063	0.440	0.869	0.955	2.669
Agriculture	12.033	0.018	0.107	0.119	0.045	0.313	41.709	0.680	42.991
Transportation	10.294	0.015	0.091	0.102	0.038	0.268	0	0.582	1.096
Communications	1.545	0.002	0.014	0.015	0.006	0.040	0	0.087	0.164
Trade	8.748	0.013	0.078	0.086	0.032	0.228	0	0.495	0.932
Services	32.174	0.013	0	0.080	0.030	0	3.924	1.819	5.866
Housing	1.765	0.003	0	0.017	0.007	0	1.884	0.100	2.011
Utilities	0.594	0.001	0	0.006	0.002	0	0	0.034	0.043
Repair and personal care	2.277	0.003	0	0.022	0.008	0	0.836	0.129	0.998
Recreation	1.176	0.002	0	0.012	0.004	0	0.484	0.066	0.568
Education	9.400	0	0	0	0	0	0.470	0.531	1.001
Health	5.004	0	0	0	0	0	0.250	0.283	0.533
Science	5.020	0	[illegible]	0.018	0.007	0	0	0.284	0.312
Credit and insurance	0.519	0.0[illegible]	0	0.005	0.002	0	0	0.029	0.037
Government administrative services	6.419	0	0	0	0	0	0	0.363	0.363
General agricultural programs	0.721	0	0	0	0	0	0	0.041	0.041
Forestry	0.457	0	0	0	0	0	0	0.026	0.026
State administration and the administrative organs of social organizations	2.717	0	0	0	0	0	0	0.154	0.154
Culture	0.839	0	0	0	0	0	0	0.047	0.047
Municipal services	0.450	0	0	0	0	0	0	0.025	0.025
Civilian police	1.235	0	0	0	0	0	0	0.070	0.070
Military personnel	3.380	0	0	0	0	0	3.200	0	3.200
Other branches	0.814	0.001	0	0.008	0.003	0	0	0.046	0.058

Table D-10 (Continued)

Sources to this table

1. *State wage bill.* See table D-8, column 7.

2. *Social-cultural and sports activities.* The total is derived in table D-3, item 2,d as 0.15 percent of the wage bill of *khozraschet* enterprises. The values for each sector are also calculated as 0.15 percent of the wage bill, using the same proxy for *khozraschet* enterprises as in table D-3, item 2,d. The budget allocation for science in 1970, net of investment, was 6.425 billion rubles (*Narkhoz 1977*, p. 562). Therefore, the estimated wage bill of *khozraschet* science enterprises is 5.020 billion rubles less 3.212 billion rubles, or 1.808 billion rubles.

3. *Militarized guards.* The total is derived in table D-3, item 2,e. It is distributed proportionally to the wage bills of the sectors in the productive sphere (industry, construction, agriculture, transportation, communications, and trade)—the sectors most likely to hire guard services.

4. *Administrative expenses of higher echelons.* The total is derived in table D-3, item 2,f. It is distributed proportionally to the wage bills of *khozraschet* enterprises as in item 2 above.

5. *Education.* The total is derived in CIA, *GNP 1970*, p. 46. It is distributed proportionally to the wage bills of *khozraschet* enterprises as in item 2 above.

6. *Research.* The total is derived in CIA, *GNP 1970*, p. 46. It is distributed proportionally to the wage bills of the productive sectors as in item 3 above.

7. *Other identified incomes.*

Construction, 0.869 billion rubles, is the sum of private earnings in construction, table D-1, item 4,a,(1), and the imputed value of owner-supplied construction services, table D-1, item 6.

Agriculture, 41.709 billion rubles, is the net income of households from agriculture, table D-1, item 2.

Housing, 1.884 billion rubles, is the sum of private earnings in housing repair, table D-1, item 4,a,(2),(a), and imputed net rent, table D-1, item 5.

Repair and personal care, 0.836 billion rubles, is derived in table D-1, item 4,a,(2),(b).

Recreation, 0.484 billion rubles, is derived in table D-1, item 4,a,(2),(c).

Health, 0.470 billion rubles, is derived in table D-1, item 4,a,(2),(d).

Education, 0.250 billion rubles, is derived in table D-1, item 4,a,(2),(e).

Military personnel, 3.200 billion rubles, is a CIA estimate of subsistence (food and clothing) expenditures.

8. *Unidentified money income.* The total, 7.464 billion rubles, is derived in table D-1, item 4,b. It is distributed proportionally to the wage bill in column 1.

9. *Total.* This is derived as the sum of columns 2 through 8.

Table D-11

Distribution of Social Insurance Deductions by Sector of Origin, 1970

	(1) Unadjusted Social Insurance	(2) Adjustments for	(3)	(4)	(5)	(6)	(7) Adjusted Social Insurance
		Repair and Personal Care	Housing-Communal Economy	Recreation	Civilian Police	Transportation	
Total	**9.436**	**0**	**0**	**0**	**0**	**0**	**9.436**
Industry	3.653	−0.120	0	0	0	0.038	3.571
Ferrous metals	0.198	0	0	0	0	0.002	0.200
Nonferrous metals	0.121	0	0	0	0	0.001	0.122
Fuels	0.325	0	0	0	0	0.003	0.328
Electric power	0.069	0	0	0	0	0.001	0.070
Machinery	1.492	−0.015	0	0	0	0.014	1.491
Chemicals	0.216	0	0	0	0	0.002	0.218
Wood, pulp, and paper	0.217	−0.002	0	0	0	0.004	0.219
Construction materials	0.227	0	0	0	0	0.003	0.230
Light industry	0.423	−0.076	0	0	0	0.004	0.351
Food industry	0.280	0	0	0	0	0.003	0.283
Other industry	0.085	−0.027	0	0	0	0.001	0.059
Construction	0.993	0	0	0	0	0.032	1.025
Agriculture	1.625	0	0	0	0	0.071	1.696
Transportation	0.694	0	0	0	0	−0.149	0.545
Communications	0.082	0	0	0	0	0	0.082
Trade	0.387	0	0	0	0	0.008	0.395
Services	1.566	0.120	0	0	0.086	0	1.772
Housing	0.163	0	−0.080	0	0	0	0.083
Utilities	0	0	0.028	0	0	0	0.028
Repair and personal care	0	0.120	0.026	0	0	0	0.146
Recreation	0.026	0	0.005	0.033	0	0	0.064
Education	0.517	0	0	0	0	0	0.517
Health	0.308	0	0	−0.033	0	0	0.275
Science	0.276	0	0	0	0	0	0.276
Credit and insurance	0.029	0	0	0	0	0	0.029
Government administrative services	0.247	0	0.021	0	0.086	0	0.354
General agricultural programs	0.032	0	0	0	0	0	0.032

Table D-11 (Continued)

Distribution of Social Insurance Deductions by Sector of Origin, 1970

	(1) Unadjusted Social Insurance	(2) Adjustments for	(3)	(4)	(5)	(6)	(7) Adjusted Social Insurance
		Repair and Personal Care	Housing-Communal Economy	Recreation	Civilian Police	Trans-portation	
Forestry	0.020	0	0	0	0	0	0.020
State administration and the administrative organs of social organizations	0.149	0	0	0	0	0	0.149
Culture	0.046	0	0	0	0	0	0.046
Municipal services	0	0	0.021	0	0	0	0.021
Civilian police	0	0	0	0	0.086	0	0.086
Military personnel	0.240	0	0	0	0	0	0.240
Other branches	0.196	0	0	0	−0.086	0	0.110

Sources to this table:

1. *Unadjusted social insurance.* This is derived from table D-12 except for the values for the total and for agriculture. The agriculture entry is derived as the agriculture value in table D-12 plus: (1) collective farm payments into the All-Union Social Insurance Fund for Collective Farmers (0.356 billion rubles—CIA, *GNP 1970*, p. 46); (2) collective farm payments into the All-Union Social Security Fund for Collective Farmers (0.780 billion rubles—Ibid); and (3) social insurance charges paid on wages of hired agricultural workers (0.018 billion rubles—Ibid, p. 66). The value for the total entry is the sum of the entries in column 1. The line item data from table D-12 are assigned to the same GNP categories as were the wage data in table D-8.

2-6. *Adjustments to social insurance deductions.* The adjustments made to the social insurance deductions are analogous to the adjustments made to the wage bill in table D-8.

7. *Adjusted social insurance.* This was derived as the sum of columns 1 through 6.

Table D-12

Social Insurance Deductions, 1970

	(1) State Wage Bill (billion rubles)	(2) Social Insurance Rate (percent)	(3) Social Insurance Deductions (billion rubles)
Total	**135.412**	**6.1**	**8.282**
Industry	50.549	7.2	3.653
Ferrous metals	2.502	7.9	0.198
Nonferrous metals	1.526	7.9	0.121
Fuels	3.663	8.9	0.325
Electric power	1.050	6.6	0.069
Machinery	19.378	7.7	1.492
Chemicals	2.575	8.4	0.216
Wood, pulp, and paper	4.623	4.7	0.217
Construction materials	3.714	6.1	0.227
Light industry	6.219	6.8	0.423
Food industry	4.125	6.8	0.280
Other industry	1.174	7.2	0.085
Construction	16.283	6.1	0.993
Agriculture	10.695	4.4	0.471
Transportation	13.099	5.3	0.694
Communications	1.545	5.3	0.082
Trade	8.601	4.5	0.387
Other branches of material production	2.049	9.6	0.196
Housing-communal economy	3.461	4.7	0.163
Art	0.469	5.5	0.026
Education	9.400	5.5	0.517
Health	5.608	5.5	0.308
Science	5.020	5.5	0.276
Credit and insurance	0.519	5.5	0.029
General agricultural programs	0.721	4.4	0.032
Forestry	0.457	4.4	0.020
State administration and the administrative organs of social organizations	2.717	5.5	0.149
Culture	0.839	5.5	0.046
Military personnel	3.380	7.0	0.240

Sources to this table:

1. *State wage bill.* This was derived from table D-9, column 3, except the total wage bill and military personnel, which are from table D-8, column 1.

2. *Social insurance rate.* The social insurance rates are from CIA, *GNP 1970*, p. 72, except for the total, total industry, fuels, other industry, other branches of material production, and military personnel. The rates for the total, fuels, and other branches of material production are derived as column 3, divided by column 1. The rates for other industry and total industry are derived as an average of the other branches of industry as described in CIA, *GNP 1970*, p. 73. The rate for military personnel is a CIA estimate.

3. *Social insurance deductions.* Total social insurance deductions are derived in CIA, *GNP 1970*, p. 46. Deductions in the fuels sector are derived above in the sources for table D-9. All other sectors, except for other branches of material production, are determined as the product of column 1 and column 2. The value for other branches of material production is determined as a residual.

Table D-13

Billion Rubles Except as Noted

Depreciation by Sector of Origin, 1970

	(1) Employment in *Khozraschet* Enterprises (million persons)	(2) Depreciation	(3) Housing Depreciation	(4) Depreciation Net of Housing Depreciation
Total	**69.856**	**31.827**	**1.318**	**31.827**
Industry	30.718	15.472	0.579	14.893
Ferrous metals	1.381	1.456	0.026	1.430
Nonferrous metals	0.676	0.811	0.013	0.798
Fuels	1.574	2.351	0.030	2.321
Electric power	0.642	1.614	0.012	1.602
Machinery	12.060	3.475	0.228	3.247
Chemicals	1.591	1.180	0.030	1.150
Wood, pulp, and paper	2.862	1.131	0.054	1.077
Construction materials	2.290	1.006	0.043	0.963
Light industry	4.160	0.518	0.078	0.440
Food industry	2.937	1.346	0.055	1.291
Other industry	0.545	0.584	0.010	0.574
Construction	9.412	2.325	0.178	2.147
Agriculture	9.628	5.713	0.182	5.531
Transportation	6.319	5.200	0.119	5.081
Communications	1.330	0.408	0.025	0.383
Trade	7.624	1.467	0.144	1.323
Services	4.825	1.196	0.091	2.423
Housing	0	0	0	1.318
Utilities	0.524	0.318	0.010	0.308
Repair and personal care	1.783	0.227	0.034	0.193
Recreation	1.050	0.304	0.020	0.284
Education	0	0	0	0
Health	0	0	0	0
Science	1.080	0.185	0.020	0.165
Credit and insurance	0.388	0.162	0.007	0.155
Government administrative services	0	0	0	0
General agricultural programs	0	0	0	0
Forestry	0	0	0	0
State administration and the administrative organs of social organizations	0	0	0	0
Culture	0	0	0	0
Municipal services	0	0	0	0
Civilian police	0	0	0	0
Military personnel	0	0	0	0
Other branches	0	0.046	0	0.046

Sources to this table:

1. ***Employment in khozraschet enterprises.*** The same proxy for ***khozraschet*** enterprises is used here as in table D-3, item 2,d. The total employment data from table D-9 are adjusted in the same manner as the wage data in table D-8, and then employment in the budgetary sectors is deleted. Employment in ***khozraschet*** science enterprises is estimated in the same manner as wages in the sources for table D-10, column 2.

2. ***Depreciation.*** Total depreciation is from CIA, *GNP 1970*, p. 49. Depreciation for total industry and each branch of industry is taken from table D-14 with adjustments made for depreciation in productive repair and personal care services, and for urban electric power distribution. Depreciation in the repair and personal care services included in Soviet industrial statistics is calculated by assuming that the capital-labor ratio in these services is one-half of the nonservice component of the same branch of industry and that the depreciation rate is the same. Depreciation in urban electric power is based on a distribution of the capital stock of the communal economy (see services below).

Depreciation in construction is the sum of reported deductions in construction (2.313 billion rubles—*Narkhoz 1978*, p. 532) plus a share of the amortization deductions of consumer cooperatives. Altough consumer cooperatives are primarily engaged in retail trade activity, they do conduct activities belonging to other sectors. According to P. I. Vakhrin (*Formirovaniye osnovnykh fondov kooperativnoy torgovli*, Moscow, Ekonomika, 1974, p. 88), the capital stock of consumer cooperatives on 1 January 1971 was distributed as shown in column 1 of the tabulation below:

Sector	(1) Capital Stock on 1 January 1971 (billion rubles)	(2) Depreciation Rate (percent)	(3) Calculated Depreciation (million rubles)	(4) Percent of Column 3	(5) Depreciation (million rubles)
Trade	5,208	5.8	302	72.4	266
Industry	1,239	7.6	94	22.5	83
Agriculture	118	6.1	7	1.7	6
Construction	94	15.1	14	3.4	12
Total	6,659	6.3	417	100.0	367

The depreciation rates in column 2 are from the 1972 I-O table. Column 3 is column 1 times column 2 and column 4 shows the percentage distribution of column 3. Column 5 is column 4 times the total, 367 million rubles (*Narkhoz 1978*, p. 532).

Depreciation in agriculture is the sum of reported deductions in agriculture (2.985 billion rubles—*Narkhoz 1978*, p. 532), a share of the deductions by consumer cooperatives (0.006 billion rubles—see construction above), and deductions made by *kolkhozy* (2.722 billion rubles—CIA, *GNP 1970*, p. 49). Depreciation in communications is from Ibid, p. 68. Depreciation in transportation is the total reported for transportation and communications (5.410 billion rubles—*Narkhoz 1978*, p. 532), less depreciation in communications (above), plus the depreciation on urban transportation recorded with the communal economy (0.198 billion rubles—see services below).

Depreciation in trade is the sum of reported deductions in retail trade (0.443 billion rubles—*Narkhoz 1978*, p. 532), supply and sales (0.530 billion rubles—Ibid), agricultural procurement (0.228 billion rubles—Ibid), and consumer cooperatives (0.266 billion rubles—see construction above).

Depreciation in services is the sum of its components.

Depreciation in utilities is based on a distribution of the capital stock of the communal economy:

Sector	(1) Capital Stock on 1 January 1971 (million rubles)	(2) Percent of Column 1	(3) Depreciation (million rubles)
Total	7,784	100.0	626
Utilities	3,951	50.8	318
Water and sewer	3,010	38.7	242
Gas	941	12.1	76
Transportation	2,458	31.6	198
Subways	1,449	18.6	117
Trams and buses	1,009	13.0	81
Electric power	700	9.0	56
Baths and laundries	204	2.6	16
Hotels	471	6.1	38

Depreciation in repair and personal care is the sum of depreciation in baths and laundries (0.016 billion rubles—above) and the depreciation deducted from industry for repair and personal care services as described above. Depreciation in recreation is the sum of depreciation in hotels (0.038 billion rubles—above) and a part of the depreciation recorded under "other branches" in the *Narkhoz* data. Other branches is assumed to include parts of the recreation (art, and resorts), science, credit and insurance, and other branches of

Table D-13 (Continued)

Sources to this table (Continued):

material production sectors (0.659 billion rubles—*Narkhoz* p. 532). The other branches depreciation was allocated among these sectors based on some very rough capital stock estimates as follows:

	Billion Rubles
Total	0.659
Recreation	0.266
Science	0.185
Credit and insurance	0.162
Other branches of material production	0.046

3. *Housing depreciation*. Total housing depreciation is from Yu. V. Peshekhonov, ed., *Razvitiye i finansirovaniye obshchestvennikh fondov potrebleniya*, Moscow, Finansy, 1978, p. 220. Housing depreciation is not separately identified in the *Narkhoz* data. Instead, it is thought to be combined with the depreciation of the sectors that operate the housing. It is assumed here that housing depreciation is distributed proportionally to employment in *khozraschet* enterprises (column 1).

4. *Depreciation net of housing depreciation*. This is column 2 less column 3 except for the total, services, and housing lines. Housing depreciation is the total line item in column 3. The total and service lines are the sum of their parts.

Table D-14

Distribution of Amortization Deductions by Branch of Industry, 1970

	Fixed Capital			(4) Depreciation Rate (percent)	(5) Depreciation (billion rubles)	(6) Structure of Depreciation (percent)	(7) Adjusted Depreciation (billion rubles)
	(1) End 1969 (billion rubles)	(2) End 1970 (billion rubles)	(3) Average 1970 (billion rubles)				
Industry	207.9	227.6	214.795	7.4	15.895	100.000	15.627
Ferrous metals	19.9	21.8	20.565	7.2	1.481	9.317	1.456
Nonferrous metals	10.0	10.9	10.315	8.0	0.825	5.190	0.811
Fuels	27.0	29.3	27.805	8.6	2.391	15.042	2.351
Electric power	28.9	31.8	29.915	5.3	1.585	9.972	1.558
Machinery	44.2	49.8	46.160	7.7	3.554	22.359	3.493
Chemicals	16.3	18.7	17.140	7.0	1.200	7.550	1.180
Wood, pulp, and paper	11.2	12.2	11.550	10.0	1.155	7.266	1.136
Construction materials	12.3	13.7	12.790	8.0	1.023	6.436	1.006
Light industry	8.4	9.3	8.715	6.7	0.584	3.674	0.574
Food industry	17.9	18.9	18.250	7.5	1.369	8.613	1.346
Other industry	11.8	11.2	11.590	6.3	0.728	4.580	0.716

Sources for this table:

1. *Fixed capital—end 1969.* This item represents the fixed capital of industry in 1955 prices on 1 January 1970. All values, except for nonferrous metals and other industry, are from Constance B. Krueger, *USSR: Gross Fixed Capital*, unpublished, May 1976, table 3. The capital stock of nonferrous metals is assumed to be one-half that of ferrous metals. The capital stock of other industry is derived as a residual.

2. *Fixed capital—end 1970.* This item is derived in the same manner as column 1.

3. *Fixed capital—average 1970.* Each entry is computed as column 1 plus 35 percent of the difference between column 2 and column 1. This is the formula used by Gosplan to compute the average value of fixed capital and reflects the fact that more than half of new fixed capital is commissioned in the second half of the year (*Ukazaniya*, p. 27).

4. *Depreciation rate.* This is derived from *Narkhoz 1970*, p. 171, except for nonferrous metals and other industry. Nonferrous metals is determined from the ferrous metals rate of 7.2 percent, and the ratio of the nonferrous metals and ferrous metals depreciation rates in the 1966 I-O table. The other industry rate is determined as column 5 divided by column 3.

5. *Depreciation.* This is column 3 times column 4 except for other industry, which is derived as a residual.

6. *Structure of depreciation.* This is column 5 in percentage terms.

7. *Adjusted depreciation.* Depreciation for total industry is derived as the sum of reported amortization deduction in industry (15.544 billion rubles—*Narkhoz 1978*, p. 532) and amortization deductions of consumer cooperatives on industrial capital (0.083 billion rubles—see the sources to column 2 of table D-13).

Table D-15

Distribution of Profits by Sector of Origin, 1970

	(1) Reported Profits (billion rubles)	(2) Bonuses (billion rubles)	(3) "Net" Profits (billion rubles)	(4) Adjustment Factor for Industrial Profits	(5) Adjusted "Net" Profits (billion rubles)	(6) Other Net Income (billion rubles)	(7) Total Profits (billion rubles)
Total	**84.621**	**5.030**	**79.591**		**79.591**	**9.563**	**89.154**
Industry	55.695	3.310	52.385	1.000	52.385	0	52.385
Ferrous metals	3.999	0.238	3.761	0.892	3.355	0	3.355
Nonferrous metals	2.699	0.160	2.539	0.914	2.321	0	2.321
Fuels	5.229	0.311	4.918	0.786	3.866	0	3.866
Electric power	3.601	0.214	3.387	0.731	2.476	0	2.476
Machinery	13.850	0.823	13.027	1.089	14.186	0	14.186
Chemicals	3.708	0.220	3.488	1.126	3.927	0	3.927
Wood, pulp, and paper	2.579	0.153	2.426	1.289	3.127	0	3.127
Construction materials	1.611	0.096	1.515	1.057	1.601	0	1.601
Light industry	6.685	0.397	6.288	1.000	6.288	0	6.288
Food industry	7.350	0.437	6.913	0.998	6.899	0	6.899
Other industry	4.384	0.261	4.123	1.052	4.339	0	4.339
Construction	4.736	0.282	4.454		4.454	0	4.454
Agriculture	4.935	0.293	4.642		4.642	7.852	12.494
Transportation	10.718	0.637	10.081		10.081	0	10.081
Communications	0.840	0.050	0.790		0.790	0	0.790
Trade	5.737	0.341	5.396		5.396	1.283	6.679
Services	1.860	0.111	1.749		1.749	0.428	2.177
Housing	0	0	0		0	0	0
Utilities	0.770	0.046	0.724		0.724	0	0.724
Repair and personal care	0.400	0.024	0.376		0.376	0	0.376
Recreation	0.040	0.002	0.038		0.038	0.428	0.466
Education	0	0	0		0	0	0
Health	0	0	0		0	0	0
Science	0.100	0.006	0.094		0.094	0	0.094
Credit and insurance	0.550	0.033	0.517		0.517	0	0.517
Government administrative services	0	0	0		0	0	0
General agricultural programs	0	0	0		0	0	0
Forestry	0	0	0		0	0	0
State administration and the administrative organs of social organizations	0	0	0		0	0	0
Culture	0	0	0		0	0	0
Municipal services	0	0	0		0	0	0
Civilian police	0	0	0		0	0	0
Military personnel	0	0	0		0	0	0
Other branches	0.100	0.006	0.094		0.094	0	0.094

Sources to this table:

1. ***Reported profits.*** Total profits are the reported value for all state enterprises (85.668 billion rubles—*Narkhoz*, p. 541) less net insurance premiums (1.047 billion rubles—CIA, *GNP 1970*, p. 46). The values for each sector are from *Narkhoz 1977*, pp. 541 and 543 with the following exceptions:

- Profits in the nonferrous metals sector are estimated in CIA, *GNP 1970*, p. 70.
- Profits in the electric power sector include the profits of the urban electric power system (0.137 billion rubles). These profits are assumed to be included with the reported profits of the communal economy (0.984 billion rubles—*Narkhoz 1977*, p. 541) which are allocated based on some data for the RSFSR as follows:

Total	0.984
Electric power	0.137
Other utilities	0.770
Repair and personal care	0.002
Recreation	0.040
Urban transportation	0.035

- Profits of the machinery; wood, pulp, and paper; light industry; and other industry sectors are reduced by arbitrary estimates of profits in repair and personal care services. Total repair and personal care profits are arbitrarily estimated at 0.400 billion rubles based on scattered republic data, of which 0.002 are included in the profits of the communal economy (above). The remaining amount is distributed as follows:

Total	0.398
Machinery	0.037
Wood, pulp, and paper	0.008
Light industry	0.277
Other industry	0.076

- Profits in the other industry sector are computed as a residual.
- Communications profits are from CIA, *GNP 1970*, p. 67.
- Transportation profits are computed as total profits in transportation and communications (11.523 billion rubles—*Narkhoz 1977*, p. 541), less profits in communications (above), plus profits in urban transportation (above).
- Trade profits are the sum of profits in trade, supply and sales, and agricultural procurement.
- Utilities profits are estimated as a share of the profits of the communal economy (above).
- Profits in the science, credit and insurance, and other branches of material production sectors are assumed to be components of the other branches category in the *Narkhoz* profit data. The reported profits of this category (1.797 billion rubles—*Narkhoz 1977*, p. 541) are reduced by net insurance premiums (1.047 billion rubles). The remainder (0.750 billion rubles) is divided arbitrarily as follows:

Total	0.750
Science	0.100
Credit and insurance	0.550
Other branches of material production	0.100

2. ***Bonuses.*** Total bonuses are from CIA, *GNP 1970*, p. 45. The total is distributed among the sectors based on the assumption that the ratio of bonuses to reported profits is the same in each sector.

3. ***"Net" profits.*** This is column 1 less column 2.

4. ***Adjustment for industrial profits.*** It is believed that the profit data in the *Narkhoz* are reported on a ministry basis. The data in this column represent the ratio of profits on a commodity basis to profits on a ministry basis in the branches of industry as estimated in V. D. Belkin (ed.), *Model' "dokhod-tovary" i balans narodnogo khozyaystva*. Moscow, Nauka, 1978, p. 119.

5. ***Adjusted "net" profits.*** This is column 4 times column 3 for the branches of industry, column 3 for all other entries.

6. ***Other net income.*** The value for agriculture represents the sum of retained income and income taxes of collective farms (table D-3, items 1,a and 3,a). The values for trade and recreation represent the sum of retained profits and income taxes of consumer cooperatives and other organizations, respectively.

7. ***Total profits.*** This is column 5 plus column 6.

Table D-16 Billion Rubles

Distribution of Turnover and Other Indirect Taxes by Sector of Origin, 1970

	(1) Turnover Taxes	(2) Other Identified Indirect Taxes	(3) Income From Foreign Trade	(4) Other Miscellaneous Charges	(5) Subsidies	(6) Total Turnover and Other Indirect Taxes
Total	**53.346**	**1.845**	**7.581**	**14.960**	**−22.553**	**77.732**
Industry	53.346	1.705	6.822	6.988	−18.688	68.861
Ferrous metals	0.059	0	−0.717	0.295	0	−0.363
Nonferrous metals	0	0	−0.383	0.189	0	−0.194
Fuels	4.630	0	−0.763	0.600	0	4.467
Electric power	0.477	0	−0.052	0.238	0	0.663
Machinery	3.200	1.260	−0.512	1.820	−0.432	5.768
Chemicals	0.494	0	1.131	0.391	−0.365	2.016
Wood, pulp, and paper	0.198	0.445	0.305	0.435	0	1.383
Construction materials	0.296	0	0.123	0.306	0	0.725
Light industry	17.795	0	6.736	1.326	−5.306	25.857
Food industry	25.283	0	0.820	1.121	−12.110	27.224
Other industry	0.914	0	0.134	0.267	−0.475	1.315
Construction	0	0	0	1.125	0	1.125
Agriculture	0	0.030	0.683	3.123	0	3.836
Transportation	0	0	0	1.121	0	1.121
Communications	0	0	0	0.107	−0.370	0.107
Trade	0	0	0	0.726	−0.530	0.726
Services	0	0.063	0	1.723	−2.845	1.786
Housing	0	0.063	0	0.131	−2.086	0.194
Utilities	0	0	0	0.070	0	0.070
Repair and personal care	0	0	0	0.165	0	0.165
Recreation	0	0	0	0.074	−0.759	0.074
Education	0	0	0	0.452	0	0.452
Health	0	0	0	0.241	0	0.241
Science	0	0	0	0.243	0	0.243
Credit and insurance	0	0	0	0.052	0	0.052
Government administrative services	0	0	0	0.295	0	0.295
General agricultural programs	0	0	0	0.033	0	0.033
Forestry	0	0	0	0.021	0	0.021
State administration and the administrative organs of social organizations	0	0	0	0.124	0	0.124
Culture	0	0	0	0.039	0	0.039
Municipal services	0	0	0	0.021	0	0.021
Civilian police	0	0	0	0.057	0	0.057
Military personnel	0	0	0	0	0	0
Other branches	0	0.047	0.076	0.047	−0.120	0.170

Sources to this table

1. *Turnover taxes.* Total turnover taxes are from table D-3, item 3.e. Of this amount, 3.966 billion rubles is the difference between gross and net turnover taxes as reported in *Gosbyudzhet 1972*, p. 14. This difference represents subsidies of various kinds paid from tax receipts, mainly children's clothing. The entire amount is allocated to the light industry sector. The distribution of the net turnover taxes (49.380 billion rubles) is estimated primarily from two sources. Taxes collected in the machinery, light industry, food industry, and the petroleum part of the fuels sector are from P. E. Kuchkin and N. N. Morozov, *Chistiy dokhod sotsialisticheskogo obshchestva*, Moscow, Finansy, 1974, pp. 155-156. Taxes collected in the ferrous metals; electric power; wood, pulp, and paper; construction materials; and the gas component of the fuels sector are taken or calculated from data in A. Tret'yakova, *Nalog s oborota v 1972*, unpublished, 1978. Taxes collected in the chemicals sector are assumed to be 1 percent of the total, and taxes collected in the other industry sector are calculated as a residual.

2. *Other identified indirect taxes.* The total, industry, and services line items are the sum of their parts. The machinery line item is the sum of price markups on radio and television sets and surcharges on agricultural machinery (table D-3, item 3.f). The wood, pulp, and paper and other branches line items are stumpage fees paid by these sectors for harvested wood. The fees are recorded as forestry income in the state budget (table D-3, item 3.f). Total forestry income (0.492 billion rubles) is divided between the wood, pulp, and paper and the other branches sectors on the basis of data from the 1972 Soviet I-O table which shows these fees as sales of the forestry sector. The agriculture line item is indirect taxes paid by *kolkhozy* and *sovkhozy* (CIA, *GNP 1970*, p. 68). The housing line item is rental payments paid by the trade sector for space in housing units used for retail trade outlets.

3. *Income from foreign trade.* Income from foreign trade is based on detailed estimates of foreign trade in 1970 valued in foreign trade rubles and the ratio of foreign trade prices to domestic prices by input-output category. First the 1970 foreign trade data in foreign trade prices were allocated to input-output sectors based on the procedures set out in Treml and Kostinsky, *The Domestic Value of Foreign Trade: Exports and Imports in the 1972 Input-Output Table*. Then the price ratios calculated in that report for each I-O sector were used to convert the values in foreign trade prices to domestic prices. The two sets of data were then aggregated from I-O sectors to GNP sectors. Each entry in this column represents net imports in domestic prices less net imports in foreign trade prices. The total exports and imports in domestic prices calculated in this manner were slightly different from the values published by Treml and Kostinsky. The domestic price data were scaled proportionally to equal their control totals.

4. *Other miscellaneous charges.* Total other miscellaneous charges are from table D-3, item 3.f. The total is distributed among all sectors on the basis of their shares in total value added less this item.

5. *Subsidies.* Total subsidies and most of the line items are from table D-3, item 4. The subsidy on agricultural machinery is allocated to the machinery sector; the fertilizer subsidy to the chemicals sector; and the processed feeds subsidy to the other industry sector. The subsidy for price differences on the procurement of agricultural products by industry is divided between the light industry, food industry, and trade sectors based on the detailed estimates in CIA, *GNP 1970*, p. 49. The subsidies on wool (0.14 billion rubles), cotton (1.15 billion rubles), and half of the subsidy on sunflower and other oil seeds, hemp, flax, kenaf, and hides (0.05 billion rubles) were allocated to the light industry. The subsidy on fresh vegetables was allocated to the trade sector. The remainder (12.110 billion rubles) was allocated to the food industry. Payments from gross turnover taxes were allocated to light industry. The subsidy on art and radiobroadcasting was divided between the communications (0.370 billion rubles) and recreation (0.258 billion rubles) sectors. The subsidy for price reductions in retail trade was allocated to the trade sector. The subsidies on housing, recreation, and the press were allocated to the housing, recreation, and other branches sectors, respectively.

6. *Total turnover and other indirect taxes.* This is the sum of columns 1 through 4.

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Appendix E

Conversion of 1970 GNP From Established Prices to Factor-Cost Prices

The 1970 GNP data in established prices are converted to factor-cost prices in four steps: (1) arrangement of the established-price data in a format compatible with Soviet input-output (I-O) definitions, (2) conversion of the established-price data to producers' prices, (3) estimation of a 1970 I-O table in producers' prices consistent with the GNP data, and (4) use of the I-O table to convert the GNP data in producers' prices to factor-cost prices. This appendix describes all four steps.

I-O tables are used to associate changes in value added by sector of origin with changes in end use expenditures. The conversion from established prices to factor-cost prices involves (1) the elimination of those elements of prices which do not reflect payments for factors of production (land, labor, and capital) or for goods and services used in the production process and (2) the reestimation of payments for capital services (profits and depreciation) to provide an equal rate of return on capital in all sectors. Because both types of changes involve the value-added component of a sector's prices, they directly affect the prices of the goods produced by that sector, whether the goods are delivered directly to final end uses or are purchased by other sectors. Changes in value added, therefore, change the prices of all final goods either directly or indirectly. Taking account of the direct and indirect sources of price changes for the elements of GNP by end use requires information on the structure of each sector's purchases of intermediate goods and services. It is this information which is included in an I-O table and which leads us to estimate a 1970 I-O table. (For a description of I-O tables in general and Soviet I-O tables in particular, see Vladimir G. Treml, Dimitri M. Gallik, Barry L. Kostinsky, and Kurt W. Kruger, *The Structure of the Soviet Economy: Analysis and Reconstruction of the 1966 Input-Output Table*, New York, Praeger Publishers, 1972.)

Arranging the GNP Data in an I-O Format

The first step in the construction of a 1970 I-O table is to fill in as much of the table as possible with the available information. In this case, the value-added quadrant of the I-O table can be filled in using sector-of-origin GNP data. Values in the final demand quadrant rely on end-use GNP data. (For a discussion of the relationship between GNP and an I-O table, see Philip M. Ritz, "The Input-Output Structure of the U.S. Economy, 1972," *Survey of Current Business*, February 1981, pp. 34-37.) In addition, gross output data can be estimated from published Soviet data.

Putting the GNP data into a Soviet I-O table requires two sets of adjustments. First, the definitions of our GNP sectors often differ from the Soviet definitions of the corresponding I-O sectors, and the data must be adjusted accordingly. Second, a Soviet I-O table includes only the so-called productive sectors. We therefore have to rearrange our GNP data for the nonproductive sectors to conform with the Soviet treatment of such data in their I-O tables. This section summarizes these two adjustments.

In order to conform with the definitions of Soviet I-O sectors we have made the following changes to the sector-of-origin GNP data in table D-6:

- The value added of the repair and personal care services included in Soviet industrial statistics was transferred to the machinery; wood, pulp, and paper; light industry; and other industry sectors.

- The value added of the utilities sector connected with water and sewage services was transferred to the other industry sector, and the value added connected with urban gas distribution was transferred to the transportation sector.

- The output of the forestry sector is redefined. In our GNP accounts, the entire output of the forestry sector is treated as a final expenditure and the stumpage fees paid by the wood, pulp, and paper and other branches sectors are included in the value added of those sectors. Soviet I-O tables define the stumpage fees as sales of the forestry sector. Sales to final demand by forestry are the difference between the gross output of the sector and first quadrant sales.

- The general agricultural programs sector was aggregated with the agriculture sector and redefined. It appears that this activity is reflected in an I-O table in value added as a subsidy rather than as a final demand expenditure.

- The subsidy on fresh vegetables, part of the value added of the trade sector in GNP, is transferred to the agriculture sector.

- The productive and nonproductive portions of the transportation and communications sectors were estimated and regrouped to form a productive transportation and communications sector and a separate nonproductive sector.

- The value added in the ferrous and nonferrous metals branches was aggregated to match the aggregate metallurgy sector in the 1972 I-O table.

- Income from foreign trade was deleted.

The end-use GNP data show total expenditures for various goods and services but do not show which sector of the economy produced them. Thus, the end-use data must be disaggregated in order to fill in the final-demand quadrant. Each column in the constructed final-demand quadrant shows the expenditures for a given end-use category of GNP. Each row shows the sales of an I-O sector to each end-use category. In many cases, such as transportation, all of the end-use expenditures represent purchases from the sector of the same title. In other cases, such as soft goods, most expenditures were for the output of one sector (light industry in this case). In a few cases, such as inventory change, essentially arbitrary choices had to be made. In disaggregating the expenditure categories, the allocations followed Soviet I-O definitions, as did the allocations of value-added data.

In addition, several modifications were made to the GNP data, and some estimates were made of missing data:

- A subsidy was added for private housing comparable to that for public housing. Imputed net rent was increased by the same amount, leaving the value added of the housing sector unchanged.
- The value added of the food industry was divided into four subsectors to match the end-use expenditures on food.
- The intermediate sales of services were estimated. The services involved are credit and insurance, repair and personal care, recreation, and nonproductive transportation and communications.
- The structure of expenditures for goods and services by the nonproductive service sectors was estimated.

In the second adjustment nonproductive service sectors were moved out of the interindustry quadrant. This produces additional rows in the value-added quadrant showing the sales of services to other sectors and additional columns in the final-demand quadrant showing the purchases of goods and services by the service sectors.

The gross output of each productive sector in purchasers' and producers' prices can be estimated from similar data in the 1966 and 1972 I-O tables and annually published production and price indexes. The gross output of an I-O sector can be estimated for any year between 1966 and 1972 in current producers' prices by multiplying the 1966 gross output from the I-O table times the constant-price production index and the price index published for that sector. This was done for each sector for 1972 and the results were compared with the corresponding data from the 1972 I-O table. The two 1972 gross-output estimates were quite close in all cases. A correction factor was computed which would equalize the two estimates. Then the average annual rate of growth of the correction factor was used in conjunction with the 1970 production and price indexes to estimate 1970 gross output in producers' prices.

The 1970 gross output of each sector in purchasers' prices was then estimated using the gross output in producers' prices, turnover tax and subsidy data from the GNP accounts, and transportation and trade data from the 1972 I-O table. The gross output of each sector in both prices is shown in the following tabulation:

Sector	Gross Output in Producers' Prices (billion rubles)	Gross Output in Purchasers' Prices (billion rubles)
Metallurgy	37.076	40.542
Fuels	22.442	34.478
Electric Power	11.511	12.011
Machinery	92.800	101.459
Chemicals	22.414	24.700
Wood, pulp, and paper	19.419	23.196
Construction materials	15.990	21.926
Light industry	62.988	78.843
Food industry	90.489	115.735
Animal products	45.961	38.396
Processed foods	12.527	19.539
Basic foods	16.235	18.749
Beverages	15.766	39.051
Other industry	12.621	13.626
Construction	67.522	67.600
Agriculture	103.800	109.295
Forestry	0.623	0.636
Transportation and communications	25.700	25.700
Trade	22.100	21.700
Other branches	3.800	4.300

The gross outputs of the service sectors were derived from the GNP data.

The result of all of the adjustments and estimates described above was a 1970 I-O table with the value-added and final-demand quadrants, the gross outputs, and a few elements of the interindustry quadrant filled in. The remainder of the interindustry quadrant was blank.

Converting the GNP Data to Producers' Prices

The 1972 Soviet I-O table was compiled and published in established or purchasers' prices. The parts of the 1970 table not filled in as described in the previous section are estimated by assuming that the relationships among the various elements of the table in 1970 are similar to the same relationships in 1972. The Soviets published only part of the 1972 I-O table. Western experts reconstructed the unpublished entries and converted the entire table to producers' prices by eliminating turnover taxes and subsidies and by separating the costs of transportation and trade services from the purchase price and showing them as a separate expense. Producers' prices are a more accurate reflection of the structure of production costs in each sector and provide a better basis for estimating the cost structure for 1970. Since the elimination of turnover taxes and subsidies is also part of the conversion to factor-cost prices, it is expedient to convert the data in the partially completed 1970 I-O table to producers' prices before completing the table. This price change is described here.

The I-O data are converted from purchasers' prices to producers' prices in four steps: (1) turnover taxes and other fees are deleted, (2) transportation and communications expenses are reallocated, (3) trade and distribution expenses are reallocated, and (4) the value added and gross output in each sector are increased by the value of any subsidies given to the sector. Turnover taxes and other fees form part of the purchasers' price of a good as an element of value added and need to be subtracted from the value added and gross output of each sector. Total turnover taxes and other fees are 54.606 billion rubles, the sum of turnover taxes (53.346 billion rubles—table D-3, item 3,e), price markups on radio and television sets (0.510 billion rubles—table D-3, item 3,f) and surcharges on spare parts for agricultural machinery (0.750 billion rubles—table D-3, item 3,f). The distribution of turnover taxes by sector is shown in table D-16. The price markups on radio and television sets and the surcharges on spare parts for agricultural machinery are part of the value added of the machinery sector. The same value of taxes and fees also had to be removed from each sector's sales to preserve the equality between total output and input. In order to subtract the taxes and fees from the rows of the I-O table, it is necessary to estimate the distribution of the taxes of each sector as an element of the sales to each sector or to a category of final demand. For this, it was assumed that the same distribution of taxes estimated for the 1972 I-O table is also valid for 1970. The taxes included in final-demand values are then subtracted directly. The taxes paid by each sector when it purchases material inputs are subtracted from each entry in that sector's column of the I-O table, summed, and placed in a new row in the value-added quadrant. The new row is necessary to preserve the equality between a sector's output and input.

The purchase price of any good includes the transportation expenses necessary to deliver the good from the producer to the purchaser. Since this expense is not a real cost of production and can be highly variable depending on the transportation mode and the type and location of the purchaser, a better estimate of the structure of production costs is obtained by subtracting this transportation expense. The cost of transportation still exists, but is now shown as a separate purchase in the transportation row.

If a complete purchasers' prices table is available, the reallocation of transportation expenses is simple. First the value of each sector's purchases of transportation and communications services is deleted and the value of its gross output is reduced by the same amount. This value represents the amount paid by the producing sector for the delivery of its output to purchasers. Then the same value is removed from that sector's row by assuming that the proportion of transportation and communications expenses in each sector's sales is equal. For example, if a sector's purchases from the transportation sector in purchasers' prices is equal to 5 percent of its gross output, then it is assumed that 5 percent of that sector's sales to each other sector and to final demand represents transportation expenses. The values removed from all of a sector's material purchases are summed and entered as a single purchase of transportation and communications services. This value represents the amount paid by the producing sector for the delivery of its material inputs.

In this case, a complete purchasers' prices table is not available. Therefore, it was assumed that the proportion of each sector's sales that represented transportation and communications services in 1970 was the same as it was in 1972. The transportation purchases by each sector were then summed and compared with the gross output of the transportation and communications sector. The calculated amount, 27.1 billion rubles, was 5 percent higher than the published gross output, (25.7 billion—*Narkhoz 1978*, p. 41). All of the 1972 transportation rates were lowered by 5 percent to remove the discrepancy, and the calculations were repeated.

The trade and distribution expenses were reallocated using the same procedure as for transportation. This operation is slightly more complicated because there are sharply different markups for wholesale trade, retail trade, and agricultural procurement services. Again the rates used for the 1972 I-O table were assumed to be valid for 1970, and the gross output of the trade sector was calculated. Again, the resulting total was 5 percent greater than the gross output of the trade sector. The same proportional reduction of the 1972 trade and distribution rates was used to remove the discrepancy.

Subsidies were removed in an analogous manner to turnover taxes and other fees. The subsidies row in the value-added quadrant was deleted, and the gross output of each sector was increased by the same amount. The same amount was then allocated among purchasing sectors and final demand, using the distribution of the corresponding subsidies in the 1972 I-O table. Finally, the estimated subsidies received by each sector on its material purchases were summed and entered as a new row in the value-added quadrant.

Estimating a 1970 Input-Output Table

The computation described in the previous two sections produced a partial 1970 I-O table in producers' prices. The remaining parts of the table were estimated based on the assumption that all production relationships should be as similar as possible to what they were in 1972 and yet be consistent with the data already filled in

Mathematically, the unknown parts of the table are estimated by minimizing the sum of squared differences between the corresponding entries of the 1972 and 1970 I-O tables. If x(i,j) is the value of the sales of sector i to sector j in 1970 and y(i,j) is the same sales in 1972, then the following is minimized:

$$S = \sum_{i=1}^{n} \sum_{j=1}^{n} (x(i,j) - y(i,j))^2 / y(i,j),$$

subject to the constraints that:

$$(1) \quad \sum_{i=1}^{n} x(i,j) = C(j), \text{ and}$$

$$(2) \quad \sum_{j=1}^{n} x(i,j) = R(i), \text{ where}$$

C(j) is the column sum of sector j (gross output less value added and other estimated purchases) and R(i) is the row sum of sector i (gross output less final demand and other estimated sales). The minimum value of S is determined by the equations:

$$(3) \quad x(i,j) = y(i,j)(1 + \lambda(i) + \mu(j)), \text{ where}$$

$\lambda(i)$ and $\mu(j)$ are Lagrangian multipliers. Substituting each equation (3) into equations (1) and (2) produces a system of 2n-1 linear equations in 2n-1 unknowns (the Lagrangian multipliers), where n is the number of sectors in the I-O table (19 in this case). The values of the Lagrangian multipliers can then be substituted back into each equation (3) to determine the actual value of each cell in the 1970 I-O table. For a detailed description of this and other methods of estimating I-O tables see John Pitzer, *An Analysis of Technical Change in the Soviet Economy: An Application of Soviet Input-Output Tables* (Ph.D. dissertation, American University, 1980).

Estimating GNP in Factor-Cost Prices

The preceding sections have described the estimation of GNP in producers' prices and a complete 1970 Soviet I-O table. In order to complete the conversion to factor-cost prices, it is necessary to eliminate the remaining elements of value added which do not represent a payment to a factor of production, estimate the capital stock of each sector, and replace Soviet profits with a capital charge which provides an equal rate of return in each sector. All of these changes directly affect value added. The I-O table is needed to compute the direct and indirect impact of the value-added changes on end-use GNP.

In any I-O table, the sum of a sector's material purchases and value added equal its gross output, or:

$$(4) \quad X(j) = \sum_{i=1}^{n} x(i,j) + w(j) + d(j) + Z(j), \text{ where}$$

X(j) is the gross output of sector j, w(j) is the labor income earned in sector j, d(j) is the depreciation in sector j, and Z(j) is all other value added in sector j. As in previous estimates of Soviet GNP in factor-cost prices, it is assumed that w(j) and d(j) adequately represent their respective variables. It is desired to compute a uniform rate of return on each sector's capital stock, r, and to reprice the output of all sectors to accommodate this uniform return. Equation (4) now becomes

$$(5) \quad p(j)X(j) = \sum_{i=1}^{n} p(i)x(i,j) + w(j) + d(j) + rK(j),$$

where p(i) is the price change required in sector i, and K(j) is the capital stock of sector j.

We make two further refinements. First, the capital stock of each sector is disaggregated to show how much was produced by the machinery, construction, and agriculture (livestock) sectors, and each portion of the capital stock is revalued according to the price variable, p(i), of the sector producing the capital. Second, the constraint is added that factor-cost GNP must equal established-price GNP. These refinements produce the system of equations

$$(6) \quad p(j)X(j) = \sum_{i=1}^{n} p(i)x(i,j) + w(j) + d(j) + r\sum_{i=1}^{n} p(i)K(i,j),$$

$$(7) \quad w(j) + d(j) + r\sum_{i=1}^{n} p(i)K(i,j) = \text{GNP (established prices)},$$

where K(i,j) is the amount of capital produced by sector i and owned by sector j.

There are n equations of type (6) and one equation (7), for a total of n + 1. There are n unknown price variables, p(i), and one unknown interest variable, r, for a total of n + 1. Equation (6) is nonlinear, however, and the system must be solved by iteration.

The capital data were derived principally from the estimates by Constance B. Krueger of capital stock by major sector in 1955 prices (*USSR: Gross Fixed Capital*, unpublished, 1976). Capital stock of the various services were estimated primarily from data in Rutgayzer, *Resursy razvitiya neproizvodstvennoy sfery*, and other monographs on the service sector. Imputed depreciation was also added for capital stock for which the Soviets do not compute amortization deductions (primarily the capital used by budget organizations).

In order to make our accounts more comparable to those of OECD countries, a compromise between the theoretical standard of an equal rate of return on capital in all sectors and the OECD practice of not imputing any return on government capital was adopted. In the version used here, the capital stock of the housing sector and of the government sectors (state administration and the administrative organs of social organizations, culture, health, education, forestry, municipal services, general agricultural programs, and civilian police) was given a rate of return one-half that of the other sectors.

With equations (6) and (7) solved, and the entire I-O table repriced in factor-cost prices, the only step remaining was to rearrange the data in accord with our definitions of GNP sectors. In effect, the adjustments described in the first section of this appendix were made in reverse order. The result is a Western-style 1970 I-O table with GNP by end use and by sector of origin in factor-cost prices as two of its components.

Part II. AN INDEX OF INDUSTRIAL PRODUCTION IN THE USSR

By Ray Converse

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An Index of Industrial Production in the USSR

Summary

Measures of industrial production are needed to gauge the pace of Soviet economic development and to calculate more general measures of economic activity such as Gross National Product. Because the official index is believed to have an upward bias, synthetic indexes of industrial production (SPIOER) have been constructed by the CIA to avoid the pitfalls of the official indexes.

The indexes provide an empirical picture of Soviet industrial development since 1950 (figure 1). Industry recorded impressive growth in the fifties as the Soviet economy rebuilt from World War II by rapidly boosting output in the machinery and construction materials branches. Beginning in 1960 the growth rate of industrial production declined precipitously, stabilizing at a slower rate before a new period of declining growth rates began in the mid-1970s.

Average Growth of Industrial Production Average Annual Percent

	SPIOER	Official
1951-59	9.4	12.0
1960-75	6.3	8.2
1976-80	3.4	4.4

SPIOER indexes are based on a sample of three types of Soviet reporting: physical output series, constant value series, and official indexes of gross output.[1] Physical output series, when available, are preferred because they avoid the distortions of disguised inflation. The products included in the index sample are classified by input-output sector and aggregated using 1 July 1967 price weights.

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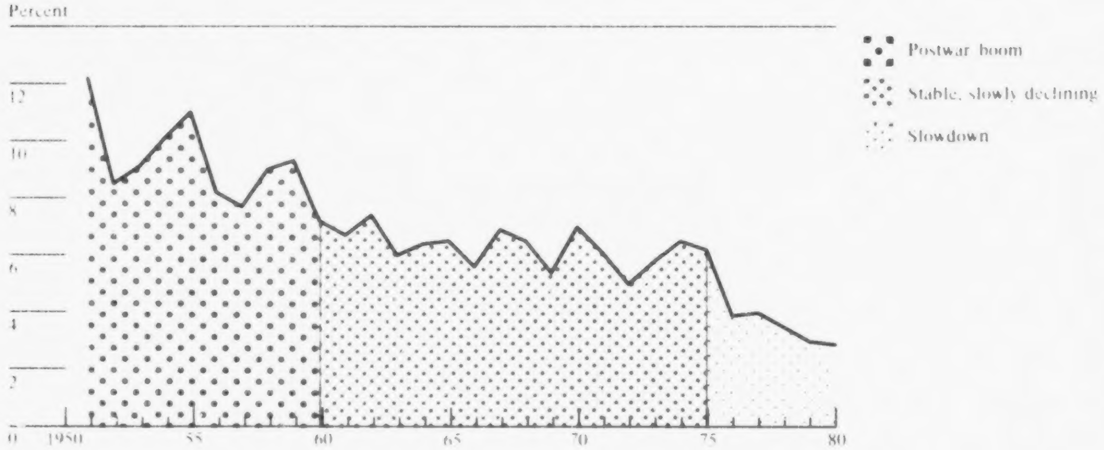
[1] Gross output is the value of production of an economic unit, such as an enterprise, ministry, branch, or all industry. In general, gross output represents shipments from the enterprise adjusted by inventory changes.

Figure 1

Growth of Industrial Production, 1950-80



To combine sector indexes into indexes for the branches of industry, we use a 1972 input-output table for the USSR to derive value-added weights within the branch.[2] The branch indexes are further aggregated into indexes for industrial materials, machinery, consumer nondurables, and total industry. The amounts of value added in each branch in 1970 (at factor cost) serve as the weights.[3]

Machinery production is treated differently because of the need for indexes for machinery components. Samples are created for nearly every machinery sector in the input-output table, and estimates of the total value added for each sector are allocated between producer and consumer durables

[2] An input-output table is a data matrix that records for a given year the technological relationships between the various sectors of an economy. Along the columns, it gives the structure of inputs of materials, labor, and capital necessary to produce a given volume of output. Along the rows, it shows how the output of a given sector is distributed among the various industries and final consumption.

[3] Value added is gross output less intermediate inputs consumed. More specifically, value added includes profits, wages, depreciation, and other payments to the factors of production plus indirect business taxes and subsidies (as a negative income).

production. The two sets of value-added weights for each machinery sector are applied to the various sector output indexes to compute separate output series for the two types of durables. These series are then combined with estimated military durable production to arrive at an index for total machinery output.

Several tests have been performed on the synthetic indexes for reasonableness in terms of consistency with collateral information, the representativeness of the sample, and biases in the basic data. Although, as expected, the synthetic indicator of industrial progress shows slower growth than the Soviet official index, the configurations of trends are similar in both indexes. The consistency is best for the most recent period, where gross distortions in official data seem less than in the past. Trends in the most important segment of industrial output—producer durables—can be compared to the key end-use component of investment in machinery and equipment. When this comparison is made, the two series match closely.

The data are inadequate to test directly for the representativeness of the sample—a crucial factor in establishing the legitimacy of any index. The high share of the total production covered by the sample in 1972—the year of the most recent input-output table, which provides information on the total volume of production—suggests that it is representative. The samples for six of the 10 branches of industry represent more than 60 percent of total branch output in 1972. Coverage is poorest in nonferrous metals and chemicals and petrochemicals.

In another test of the SPIOER's accuracy, the industrial growth implied by the 1959, 1966, and 1972 input-output tables was compared with the growth registered by SPIOER indexes over the same periods. The SPIOER samples generally grow more slowly. This could suggest some downward bias in the synthetic indexes, but the discrepancy could also result from using the spurious official price indexes to deflate the input-output tables to constant prices to arrive at "comparable" growth rates with the synthetic indexes.

SPIOER's reliance on gross output rather than value-added indexes could be an important source of bias but does not seem to be. We in effect are assuming at the sector level that the ratio of value added to gross output has remained constant. Analysis of the gross output and value-added components of the input-output tables for 1959, 1966, and 1972 suggests that the error resulting from this assumption is not serious.

The performance of SPIOER is least satisfactory in controlling the biases in the basic data. Series that measure output in quantity terms almost certainly understate the true growth rate because they fail to account for improvements in quality and changes in product mix. While this conceptual problem applies to nearly all the quantity series, it undoubtedly is most serious in the machinery branch. Similarly, disguised inflation that enters the value series, usually under the guise of new-product pricing, leads to an overstatement of growth. This occurs when enterprise managers make minor modifications to an existing product to justify a price higher than would be warranted by the marginal improvement. This problem is most acute in the machinery branch, especially in producer durables where the value series have a large weight and grow much faster than the physical output series. On one hand, evidence suggests that the quantity series may bias the growth rate for selected machinery products downward by as much as 1 percentage point per year; the bias in quantity series for other branches probably is smaller. On the other hand, indications exist that disguised inflation in the value series in our machinery sample may display growth trends that are biased upward by as much as 3 percentage points per year. (The value series are not a significant problem in other branches because of their infrequent use and small weight.)

As for the net effect of these biases, if all the difference in growth rates between the value and physical series in the producer durables sector, where the problems of bias are the worst, were actually attributable to inflation, the SPIOER index would overstate machinery growth by a maximum of 1.2 percentage points per year and overall industrial growth by 0.3 percentage point. But the machinery inflation bias is probably much less because the quantity series, by understating growth, partially offset the upward biases of the value series.

An Index of Industrial Production in the USSR

Introduction

Any attempt to assess Soviet economic development and to measure aggregate economic activity requires a reliable measure of industrial production. The official measures prepared by Soviet statistical agencies are unreliable by Western standards, so independent estimates are necessary.[4] The CIA's Office of Economic Research Indexes of Soviet Industrial Production (SPIOER) circumvent weaknesses inherent in official statistics. These indexes, first published in 1963, have been revised over the years to improve the methodology and adjust to data availability.[5]

The current revisions, like their predecessors, adopt as a model the Federal Reserve Board's industrial production index for the United States. The revised methodology enhances SPIOER's compatibility with the structure of Soviet input-output tables and makes the SPIOER branch indexes more comparable in scope with official time series. Frequent changes in reporting procedures—a persistent problem with Soviet data—make earlier versions of the indexes less representative with time and force an inappropriate reliance on obsolete data. Therefore, this revision of SPIOER tries to conform to current Soviet reporting practices.

This paper first describes the updated SPIOER procedures. The revised methodology is described in terms of the taxonomy of the individual indexes, the standard approach, the special case of machinery, and the computation of the total industry index. The next section presents the indexes and discusses the pattern of industrial growth from 1950 to 1980. In the last section both the indexes and the samples are subjected to several tests to determine their reasonableness.

The Revised Methodology

Taxonomy of the Industrial Index

The revised industrial production index uses a five-tier stratification of industry:

- Individual *products*, for example, iron ore.
- Input-output *sectors*, for example, ferrous ores.
- *Branches* of industry, for example, ferrous metals.
- Major industry *groups*, for example, industrial materials.
- *Total* industry.

The process of going from product samples to an index of total industrial production is summarized in figure 2. Product data are aggregated into sector indexes using 1 July 1967 prices as weights. That is, output of a given product in physical units is multiplied by its July 1967 price, and the value is summed together with like values for other products of the sector to obtain a value from which a sector index can be calculated. Branch indexes are calculated from sector indexes using value added derived from the 1972 input-output table in producer prices to eliminate the double-counting inherent in adding the value of output of earlier stages of production to values at later stages—for example, adding the value of iron ore to the value of steel. The aggregations from branches to industry groups and finally to total

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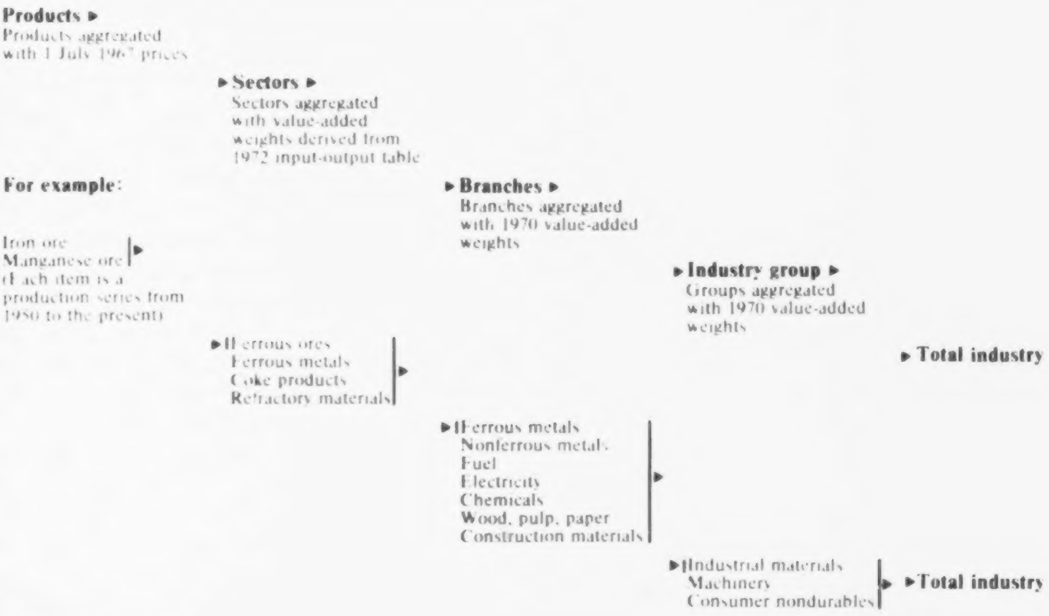
[4] The problems of the official Soviet measures are discussed in CIA, *Comparing Planned and Actual Growth of Industrial Output in Centrally Planned Economies*, ER 80-10461 (August 1980).

[5] Descriptions of the changing methodology behind these indexes have been published over the years. For example, the writings of the late Rush V. Greenslade are especially prolific on this topic. In particular, see "Industrial Production Statistics in the USSR," in Vladimir G. Treml and John P. Hardt, eds., *Soviet Economic Statistics*, (Durham: Duke University Press, 1972), pp. 155-194; with Wade Robertson, "Industrial Production in the USSR," *Soviet Economic Prospects for the Seventies*, US Congress, Joint Economic Committee (Washington, D.C.: Government Printing Office, June 27, 1973), pp. 270-282; and "The Real Gross National Product of the USSR, 1950-75," *Soviet Economy in a New Perspective*, US Congress, Joint Economic Committee (Washington, D.C.: Government Printing Office, October 14, 1976), pp. 269-300. See also F. Douglas Whitehouse and Ray Converse, "Soviet Industry: Recent Performance and Future Prospects," *Soviet Economy in a Time of Change*, vol. 1, US Congress, Joint Economic Committee (Washington, D.C.: Government Printing Office, October 10, 1979), pp. 402-422

Figure 2

A Capsule View of How the Index Is Constructed


Products ▸
Products aggregated with 1 July 1967 prices
▸ Sectors ▸
Sectors aggregated with value-added weights derived from 1972 input-output table
▸ Branches ▸
Branches aggregated with 1970 value-added weights
▸ Industry group ▸
Groups aggregated with 1970 value-added weights
▸ Total industry
For example:
Iron ore
Manganese ore
(Each item is a production series from 1950 to the present)
Ferrous ores
Ferrous metals
Coke products
Refractory materials
Ferrous metals
Nonferrous metals
Fuel
Electricity
Chemicals
Wood, pulp, paper
Construction materials
Industrial materials
Machinery
Consumer nondurables
▸ Total industry

industry are accomplished with independently derived 1970 value-added weights based on factor cost rather than established prices.*

The advantages of classifying machinery production by end-use designation require some departures from this basic procedure. Individual machinery products are divided into producer durables and consumer durables. In addition, estimates of output for the defense sector must be included. This then leads to machinery subsectors and subbranches based on the two classifications of durables produced. At the major industry group level, no distinction is made and all products are combined under a single machinery group.

The Product Sample. The major building blocks of this index are the 312 products that form the sample of industrially produced goods. These products are measured in one of three ways: physical quantities, values, or indexes.

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* Established prices are the actual prices existing in the Soviet Union for transactions. We believe that these prices are seriously distorted because of indirect taxes and subsidies, and because supply and demand forces do not play a role in price formation. Therefore, we adjust the established prices to a factor cost basis so that the prices will better represent the cost of the resources used in production. This adjustment is done by eliminating subsidies, indirect taxes, and profits and imputing a capital charge based on each sector's stock of fixed and working capital. For a full discussion of this procedure, see JEC, *GNP, 1950-80.*

The most common description is a statistical production series expressed in physical terms: tons, square meters, units of production, or some other conventional measure. Examples of this type of data are tons of coal, square meters of tile, or number of subway cars. The product series are then multiplied by actual or estimated 1967 enterprise wholesale prices to derive constant price series. In some cases the raw product data are adjusted by indexes of quality change in the average or standard product over time. For example, not only has Portland cement production increased over time, but the output mix has steadily shifted in favor of higher "marks" (greater strength) of cement. Raw figures for Portland cement production are therefore weighted by both the 1967 wholesale price and an index of average mark to account for the improved quality of the product over time.

Official ruble value series reported by the Central Statistical Administration of the USSR (CSA) are also used as sample elements. A few examples are the value of production of agricultural machinery, metal-cutting machine tools, and forge presses. Until recently these series were reported in official 1967 wholesale prices, although earlier years were reported in 1955 wholesale prices. In 1976 the Soviets began to publish these value series in prices of 1 January 1975. The official statistics have overlap in the different prices for a given year to permit an approximate linkage between the earlier and later periods, so that a common price basis can be maintained. Since the physical output samples are weighted by 1 July 1967 prices, the new value indexes were linked backward to estimate them in 1967 prices to conform with the remainder of the sample.

These rubles series, however, must be used with caution because many of them contain a large degree of concealed inflation. The products in this category are usually machinery items subject to the problems of new-product pricing. Some share of the reported growth arises from the use of first temporary prices and then permanent prices that are substantially higher than increased performance would justify.[7] In addition, since these series include both intermediate and final goods, they contain a substantial amount of double-counting. To the extent that the magnitude of double-counting has fluctuated over time, these series could be biased up or down.

The third kind of production measure consists of gross value of output (GVO) indexes prepared by the Soviets for various product groups such as mineral chemicals, repair of machinery, and metal structurals. They are supposed to represent the aggregation of all output in a given branch—sometimes including work in process and major repairs. These indexes are subject to even greater limitations than the CSA value series.[8] Therefore, they are used only to fill out the sample in some crucial areas where better indicators are lacking.

Although each line item in the SPIOER sample ostensibly consists of a production entry for every year since 1950, the quality of coverage is not uniform. Some gaps in coverage exist for the earlier years, especially during the 1950s. These gaps fit three categories: missing intervening observations at irregular intervals, series that begin several years after 1950 despite production during earlier years, and items not produced in earlier years. The extent of the resulting problems and procedures to circumvent them vary by type of gap.

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[7] See the section "Biases in the Basic Data" for a fuller treatment of the new-product pricing phenomenon. It has been widely discussed in the literature. In particular, see Abraham S. Becker, *Ruble Price Levels and Dollar-Ruble Ratios of Soviet Machinery in the 1960s*, Report R-1063-DDRE (Santa Monica, California, The Rand Corporation, 1973); Joseph S. Berliner, *The Innovation Decision in Soviet Industry* (Cambridge, The MIT Press, 1976); Padma Desai, "On Reconstructing Price, Output and Value-Added Indexes in Postwar Soviet Industry and Its Branches," *Oxford Bulletin of Economics and Statistics* (February 1978): pp. 55-77; Central Intelligence Agency, *An Analysis of the Behavior of Soviet Machinery Prices*, 1960-73, ER 79-10631 (December 1979); and James E. Steiner, *Inflation in Soviet Industry and Machine Building and Metalworking (MBMW), 1960-1975*, SRM 78-1042 (Working paper, July 1978).

[8] As an index, the output data are expressed only as a proportion of another year. The publication of indexes with different base years and in extremely rounded form limits accuracy. In addition, an index cannot be scaled to compare its relative importance with activity elsewhere in the economy.

Missing intervening years are the most common type of gaps in the SPIOER data. A typical series is fairly complete except for a few years when the relevant production data fail to appear in either an edition of the *Narodnoye khozyaystvo* or in one of the two editions of the statistical compendium *Promyshlennost'*. In general several benchmark observations are available for these series—most often for 1950, 1953, 1955, 1958, and 1960—although the precise configuration of benchmarks varies from series to series. This problem affects around 50 of the statistical series or about 15 percent of the sample. Almost all of these cases are concentrated in three branches of industry: ferrous metals, processed food, and machinery. In all instances of this kind, years between benchmarks are interpolated by assuming that the average annual rate of growth between benchmarks is constant. Since we have little interest in year-to-year comparisons during the 1950s, this procedure should not introduce a significant distortion.

The second type of gap occurs when Soviet statistical authorities fail to extend a newly published series back in time. This is potentially a more serious problem because extrapolation of a data series to complete it involves more uncertainty than interpolation. However, this problem is limited to less than 20 series or about 5 percent of the sample. About three-fourths of these occur in the machinery branch. Several different approaches are used to adjust the series depending on the availability of other information. For example, production data on three different types of boilers are published in different units for earlier years only. A year in common is used to splice the series together, and then extend the desired series backward. The index series for printing machinery and equipment does not extend back to 1950, so quantity production series available in the earlier years for two types of printing equipment are used to extend the full series. For some ruble series and index series in the sample, statistical correlations between GVO branch indexes and product series are used to extend the product series back in time. Metalwares, metal structurals, light industry and processed food industry machinery and equipment, and mineral chemicals are examples where this procedure is used. In a few instances—furniture, logging and paper machinery, machinery repair, and carpeting—the series are merely extrapolated backward assuming a constant average annual rate of growth equal to the rate for the first five years for which data were published.

The assimilation of new products into SPIOER poses a different statistical problem whose treatment depends on the type of data series used for the new product. In most cases the line items in the sample are so aggregated that a new product merely falls within the rubric of an existing broader classification. Physical product series often cannot be adequately disaggregated to account for the effect of new products and a changing product mix. This can be a serious handicap because the entire output of a given commodity or commodity class—bulldozers in construction machinery, for example—has to be given a single average or representative unit price for the entire period. Other examples of quantity series in SPIOER where new products are included in output statistics, but where the average price may not fully reflect them are synthetic plastics and resins, synthetic knits and fibers, and scrapers.

In those instances where the SPIOER disaggregation accounts specifically for new products—such as tractors, automobiles, and trucks—another procedure is used. If the product is considered essentially new, it is added into the sample at its 1967 price or its first permanent price for models introduced after 1967. If the product is considered a modification of an earlier model, production is added to the output of the similar model at the earlier model's price.

The problem of accounting for new products does not apply to the value and index series. Because these series presumably cover all products in a given category, they include new products and reflect changes over time in the product mix. However, value series also include the value of output of intermediate products as well as the disguised inflation mentioned earlier. All of these problems associated with the treatment of new products are discussed in detail later in the paper.

In addition to gaps in coverage for the earlier years, there are numerous problems with the more recent data, which are both difficult to quantify and potentially more serious. During the past decade, Soviet statistical authorities have continuously reduced the amount of information reported from one year to the next. The "Industry" section in the latest *Narkhoz*, for example, contains only 80 pages in contrast to the 142 pages in the 1970 edition. At least 10 percent of the SPIOER series published directly in the *Narkhoz* in 1970 no longer appear there. Thus, greater reliance must be placed on estimates based on other sources. The information on which to base these estimates also has become more fragmentary, so that the estimates are more subject to error. Since the Soviets are more likely to delete publication of a series when its growth trend becomes unfavorable, SPIOER estimates may suffer from an upward bias. Fortunately, the series deleted from standard publication so far have not had a major impact on the SPIOER sample, but the trend is potentially troublesome.

In terms of the absolute number of sample items, the physical output series dominate—they account for 292 (94 percent) of the 312 statistical series in the index. (See appendix A-1 for a listing of the sample.) The CSA value series account for another 4 percent and the GVO indexes comprise the remaining 2 percent of the sample. Comparisons of the absolute number of statistical series are deceptive, however, because some series have significantly greater impact on the aggregate indexes than other series. The approximate share of each type of statistical series in the industry portion of the 1972 Soviet input-output table weighted by value added is:

Type of Series	Percent	
	Including Unrepresented Products [a]	Excluding Unrepresented Products
Quantity	73.3	79.7
CSA rubles	10.7	11.6
CSA gross value of output index	8.0	8.7
Unrepresented	8.0	

[a] Unrepresented products are those items lacking any SPIOER counterpart. Some examples of this are cable products, tools and dies, and construction materials machinery and equipment.

The relative importance of value and index series based on the share of industrial output they represent is three times more than their importance based strictly upon a count of the number of series used. Nonetheless, quantity series still have much the largest weight in the calculation of SPIOER indexes.

Sectors, Branches, and Groups. The next step-up in the taxonomy of the industrial production index is the input-output sector. This level is based on the 88-sector version of the 1972 input-output table in producer prices, of which only the first 81 sectors constitute Soviet industry.[9] The remaining sectors consist of nonindustrial activity such as agriculture, transportation, communications, and retail trade. Adapting SPIOER indexes to the input-output framework permits us to (1) compare our indexes with the 1959, 1966, and 1972 input-output tables, (2) determine changes in the production mix over time, (3) judge the representativeness of our sample, and (4) most importantly, employ value-added weights at a fairly disaggregated level. SPIOER product series currently represent all but 12 of the 84 industrial sectors. Of the 72 sectors covered, 58 sector indexes are determined at least partially by quantity samples, 11 are partly value series, and five are based solely on the CSA gross value of output indexes.

The level immediately above the input-output sector is the Soviet branch (*otrasl'*), which is formed by combining selected input-output sectors. Branch-level indexes have three advantages: (1) the 10 major branches are much more manageable for analysis than the numerous input-output sectors; (2) the branch structure matches published Soviet data and, therefore, facilitates comparisons and tests of the SPIOER indexes; and (3) value added at factor cost can be calculated from Soviet data only at the branch level or above in 1970—the base year for CIA's GNP accounts.[10]

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[9] The metal-producing sectors are an exception. The 1972 reconstructed input-output table combines ferrous metals, ferrous ores, nonferrous metals, and nonferrous ores into one sector. This is inadequate disaggregation for our purposes. Thus, we use relationships among these four sectors from the 1966 table in 1970 producer prices to estimate value added in the four sectors in 1972. For our purposes, therefore, the input-output table has 84 industrial sectors.

[10] See JEC, *GNP, 1950-80*.

Table 1 Percent

Share of Branch Value Added in 1972 Accounted for by Different Statistical Series

Branch	Type of Series			
	Quantity	CSA Value	CSA GVO	Unrepresented [a]
All industry	73.3	10.7	8.0	8.0
Ferrous metals	94.8			5.2
Nonferrous metals	62.7			37.3
Fuel	100.00			
Electric power	100.00			
Machinery	53.3	18.5	23.9	4.3
Chemicals	77.4		4.1	18.7
Wood, pulp, and paper products	78.4	16.7		4.9
Construction materials	100.00			
Light industry	63.9	36.1		
Processed food	100.00			

[a] This category consists of industrial activity lacking any representation in SPIOER, such as nonferrous ores, cable products, and tools and dies.

As indicated above, the impact of the less desirable CSA value and index series on all industrial indexes is confined to less than one-fifth of the weight. Ideally, the relative importance of each type of series would be about the same in the various branches of industry as in the total, so that no branch index would suffer more from the biased sector indexes than any other. Unfortunately, this is not the case. Only about one-half of the machinery index is accounted for by quantity series, nearly one-fifth by value series, and approximately one-fourth by the least desirable GVO series. Other than machinery, the impact of the value and GVO series on branch estimates is quite limited (table 1). Only in light industry do value series represent more than one-third of total value.[11]

The highest level of subaggregation is the major industry group, which resembles the major components of the Federal Reserve Board's index of US industrial production (table 2). SPIOER has three major groups: industrial materials, total machinery, and consumer nondurables.

Construction of the Standard Indexes

Alternative Approaches. Measurement of output becomes a problem when the output of several diverse products must be combined into one series. One approach, and the basic method employed in the USSR, sums the values of the individual products to yield the gross value of output (GVO). This index usually appears in one of two variants. The first, the gross turnover of output *(valovoy oborot)*, includes intraplant consumption of a plant's own products calculated by summing the value of output of individual workshops within the plant. Most Soviet production statistics that are published in physical quantities include intraplant consumption. A second variant, the gross product *(valovaya produktsiya)*, removes materials and intermediate products fabricated by workshops that are consumed within the plant. In general,

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[11] "Light industry" as used in this paper differs from the standard light- industry versus heavy-industry dichotomy used in the West. An appropriate synonym for light industry in the present context is soft goods consisting of articles such as textiles, clothing, and footwear.

Table 2

SPIOER Industrial Groupings

Total industry	
Industrial materials	Ferrous metals
	Nonferrous metals
	Fuel
	Electric power
	Chemicals and petrochemicals
	Wood, pulp, and paper products
	Construction materials
Machinery	Civilian machinery
	Producer durables
	Consumer durables
	Military machinery
Consumer nondurables	Light industry
	Processed food

production series reported in value terms are computed on this basis.[12]

The gross-output method of aggregation is misleading, however, because the values include some intermediate product already counted elsewhere. For example, this procedure counts the value of coking coal used in manufacturing steel both in the output of the coal industry and in that of the steel industry. If the steel is used elsewhere in industry, the coking coal will be counted again.

If the amount of double-counting of production is constant and the industrial structure is stable, then the bias in the computed growth rate is minimal since the growth rate of value added and gross output of each enterprise will be nearly identical. A small bias arises because the output of the separate enterprises will be combined by gross-output weights rather than value-added weights.[13]

The principal bias from double-counting arises, however, from increasing vertical specialization in the production of a given commodity. This causes the gross output of an enterprise to rise faster than value added. The bias caused by this type of double-counting is particularly severe over time, where the economic structure is rapidly changing. By any standard, Soviet industry has grown rapidly over the last three decades and the degree of specialization has increased somewhat.

Soviet industry is notorious for its autarky. Because of the vagaries of its distribution system, enterprise and ministry managers want to control as much as possible the production and distribution of the material inputs needed by their enterprises. Enterprises and ministries frequently produce goods that clearly are not their specialty. Soviet planners and academics have long realized that this excessive vertical integration hampers efficiency, and there have been numerous campaigns over the years to encourage specialization. To the extent these campaigns have been efficacious, this would increase double-counting and the upward bias of gross output as a measure of the growth of industrial production.

The construction materials industry is a prime example of how a changing industrial structure causes double-counting to increase. At one time, most cement was shipped directly to the construction industry. Soviet leaders decided, however, to "industrialize construction" by fabricating as many construction elements—such as walls, bathroom units, and railroad tracks—as possible in a plant instead of on site by the construction industry. This means that much of the cement is now converted into precast concrete products by other plants within the construction materials industry, and a larger share of cement output is now double-counted than formerly.

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[12] For a discussion of the two types of gross output measures, see M. R. Eydel'man, *Mezhnotraslevoy balans obshchestvennogo produkta*, (Moscow: Statistika, 1966) pp. 200-203, A. I. Yezhov, *Statistika promyshlennosti*, (Moscow: Statistika, 1977), pp. 57-61, and Vladimir G. Treml, Dimitri M. Gallik, Barry L. Kostinsky, and Kurt W. Kruger, *The Structure of the Soviet Economy: Analysis and Reconstruction of the 1966 Input-Output Table*, (New York: Praeger Publishers, 1972), pp. 45-46.

[13] For a discussion of the biases of gross-output measures and double-counting, see Rush V. Greenslade, "Industrial Production Statistics in the USSR," pp. 155-194.

Finally, industries with a high ratio of material inputs to gross output are more susceptible to biases imposed by double-counting. This means we would expect a greater danger of significant bias in the measurement of machinery, chemicals, and construction materials output and a smaller bias in the remaining branches.

The preferred measure for most purposes is the sum of value added by industrial sector, where value added equals gross value of output of a sector less purchases of goods and services from other sectors of the economy. Value added measures the net contribution of a particular industry to national product. It is the sum of profits, wages, depreciation, other payments to the factors of production, and indirect business taxes less subsidies. To construct a value-added index, however, requires accurate data on production (quantities and prices) and purchases of inputs from other sectors (quantities and prices).

Two approaches have been used to derive indexes of value added in constant prices. One approach—referred to in the economic literature as double-deflation—measures both outputs and intermediate inputs in constant prices, where value added is the difference between the two. This can be accomplished in one of two ways: either constant price measures for output and intermediate inputs can be used or current price measures for each individual component can be deflated with price indexes. The information requirements of this approach are extremely rigorous because both outputs and purchases from other sectors of the economy must be tracked over time. While reported Soviet production data are deficient in quantity and quality, statistics on material inputs are even scarcer. For this reason, double-deflation is not practical in compiling SPIOER.

An alternative approach (used in the Federal Reserve Board's index of US industrial production) is a hybrid procedure that combines gross output indexes with value-added weights for a base year. This approach, known as a single indicator method, is as good as double-deflation only if gross output and purchases from other sectors move over time at the same rate. Since this is a rough approximation at best, the hybrid FRB-type indexes only approximate a true value-added series. They do remove most of the double-counting inherent in pure GVO measures of industrial production (completely in the base year, less than completely in other years).

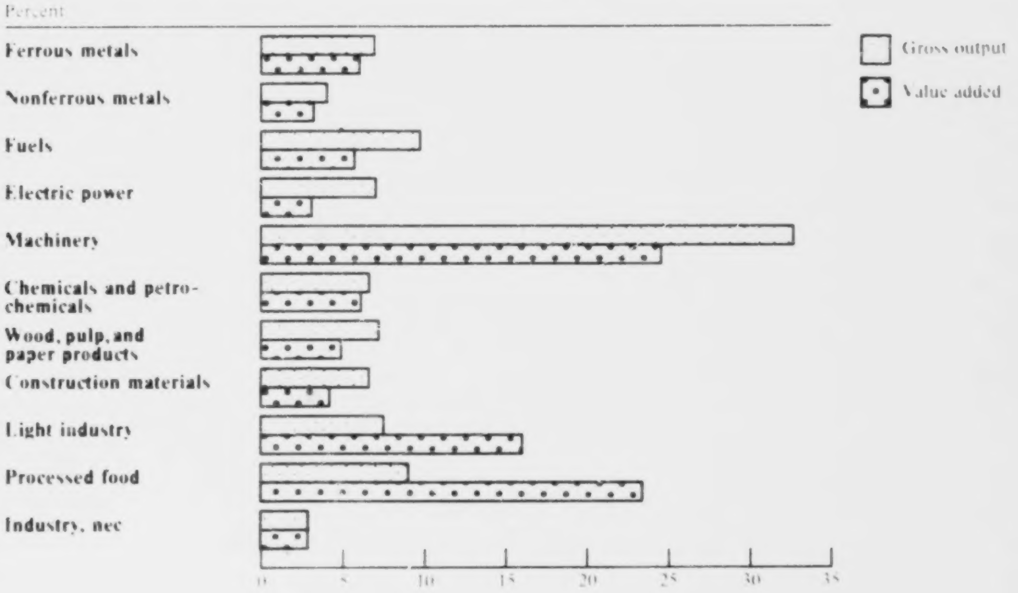
While double-deflation is closer than the single indicator approach in theory to the notion of value added, both the output and input indexes used by double-deflation must be accurate. T. P. Hill has argued convincingly that under fairly weak assumptions errors in the output and input indexes will compound measured bias rather than offset each other and that using a single indicator will produce a more accurate result. Moreover, Hill's study of growth in several OECD countries suggests that on average the growth rate is not much different whether double-deflation or a single indicator is used. Although the method used undoubtedly affects the measured growth of some components of industrial activity, these differences tend to cancel out.[14]

Depending on whether gross output or value added is used, one may receive an entirely different impression of both industrial structure and growth. In figure 3 the share of industrial production by branch of industry in 1972 is displayed both for gross output and value-added weights. The gross-output scheme tends to give a higher weight to sectors that either produce mainly for final consumption or are highly material intensive and a lesser weight to sectors that either produce mainly for further industrial processing or are highly labor and capital intensive. Thus, to the extent that industries with the most double-counting are growing relatively slowly, the gross- output index is biased downward and vice versa. In the Soviet case, both light industry and processed foods have lagged behind other branches whereas machinery has grown the fastest. With gross-output weights, light industry and processed food gain in importance and machinery loses. Other things being equal, therefore, Soviet gross output of industry tends to increase more slowly than value added.

[14] For an extensive discussion of the properties and relative merits of the two methods, see T. P. Hill, *The Measurement of Real Product: A Theoretical and Empirical Analysis of the Growth Rates for Different Industries and Countries*, (Organization for Economic Co-operation and Development, 1971), pp. 11-37, 111-112, 118-119.

Figure 3

Branch Share of 1972 Industrial Gross Output and Value Added



Derivation of the Branch Indexes. For reasons enumerated above, the SPIOER indexes use the single indicator technique to measure industrial production. Computing the branch indexes involves: creating the sector indexes, deriving the sector value added, and aggregating the sectors into branches. The indicator used is based on gross output. The method for estimating the indexes described below applies to every branch except for machinery, where the methodology is slightly more complicated.

To construct the 72 sector indexes, the sample of industrial products is classified by input-output sectors to develop a series of subsamples. Each individual line item is multiplied by its 1 July 1967 enterprise wholesale price to convert all sample items into value terms. Then for each sector in every year all of the line items in a subsample are summed to yield a value series for sample output in that sector. Finally, these sector series are indexed to the base year of 1970.

Next value added in each sector is derived for 1972 from the reconstructed input-output table in producer prices.[15] Total purchases by each sector are subtracted from its gross outlays (or gross output.)[16] For other years value added in each sector is computed by finding the ratio of the value for the sector index in each year to its value in 1972 and then multiplying this ratio by value added in 1972 as derived from the input-output table.

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[15] A somewhat more aggregated form of this input-output table appears in the article by Dimitri M. Gallik, Gene D. Guill, Barry L. Kostinsky, and Vladimir G. Treml, "The 1972 Input-Output Table and the Changing Structure of the Soviet Economy," *Soviet Economy in a Time of Change*, vol. 1, pp. 423-471.

[16] This particular version of the 1972 table allocates the taxes and subsidies on the purchases of every sector to the interindustry quadrant. This avoids the problem of a negative value added that would arise in many of the sectors in the processed food branch. Since food prices are held down artificially by the government, many of these sectors must receive substantial subsidies.

Finally, to obtain the branch indexes, every sector is first allocated to one of the 10 industrial branches. Then for each year the estimated value added for all of the sectors belonging to that branch are totaled. After totals for each branch are converted to indexes with base 1970 = 100, these branch indexes are equivalent to an aggregation of production indexes using value-added weights.

This procedure entails at least four possible sources of error:
- The samples for each sector may be unrepresentative of actual gross output over time.
- Value added may not move in the same way as gross output because the material intensiveness of production may have changed.
- Value-added estimates for the sectors may be wrong because in the reconstruction of the 1972 input-output table they were derived as a residual, and thus are subject to all of the uncertainties that plague any residual.
- The price bases of the input-output table (1972 prices) and the product sample (1967 prices) are both different from the 1970 prices that should be used.

These possible sources of error are discussed in detail below in the section, "Evaluation of the New Indexes."

The Machinery Index
The machinery index has undergone substantial revision since the methodology was last described in 1976. Revisions have focused on five areas:

- More machinery sectors are represented in the producer durables indexes.

- Passenger automobiles for private purchases and other consumer-oriented automotive products have been shifted from the producer durables to the consumer durables component of the machinery index.

- Some sectors producing both consumer durables and producer durables have separate indexes to represent each component.

- The *Tovary* series adjusted to deduct furniture production is no longer used as the sole measure of consumer durables.[1]

- Finally, new weights for producer and consumer durables have been derived with the help of the 1972 input-output table.

The machinery branch is handled differently because we want to disaggregate branch output according to how the machinery is used (figure 4). Since the use of value-added weights implies a production orientation and the different components of the machinery index are based on end use, the disaggregation is not easy. The first useful end-use distinction within machinery is between civilian machinery and military machinery. Here, military machinery excludes common-use durables—products with both civilian and military applications, such as trucks or bulldozers—because they are already reflected in production reported by the CSA. Since the USSR publishes no statistics on uniquely military machinery production, we rely on CIA estimates.

A second useful distinction within the machinery branch is between producer durables and consumer durables, reflected only infrequently in Soviet statistics. Consumer durables output appears indirectly in the official *Tovary* time series. Although SPIOER formerly used this series as a proxy for consumer durables, it neither consists exclusively of consumer durables nor does it contain all consumer durables. For example, the *Tovary* series includes nondurables such as household chemicals, and may exclude the production of passenger cars destined for private purchase. Because reliable official data are not at hand to separate consumer durables from producer durables, we must use an alternative method.

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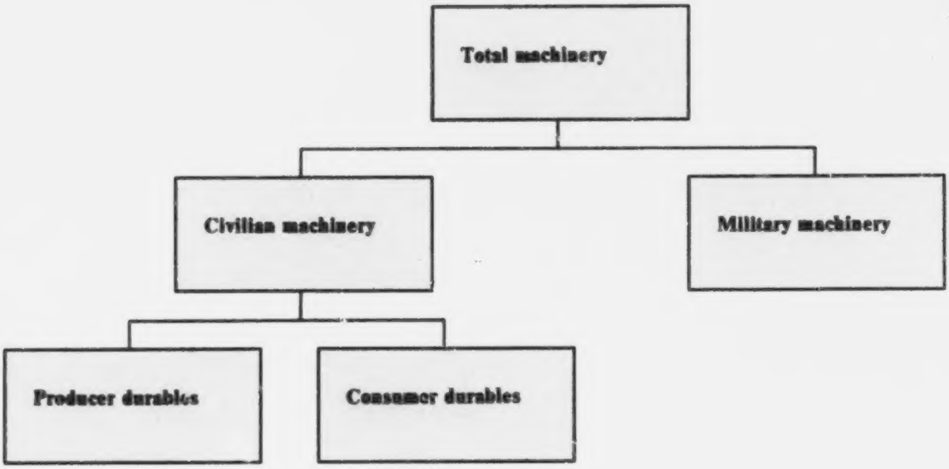
[1] The full title of this series is "production of commodities of cultural-everyday significance and household articles" (*proizvodstvo tovarov kul'turno-bytovogo naznacheniya i khozyaystvennogo obikhoda*). Hereafter this series is referred to as *Tovary*.

Figure 4

Structure of the Machinery Branch



To achieve the desired disaggregation of machinery production according to end use, we rely on the categories of final demand included in the reconstructed Soviet input-output tables. These tables allocate final demand among three categories: private consumption, public consumption, and other final demand. We assume that the machinery-producing sectors allocate consumer durables output to private consumption. Public consumption contains "consumption of material product by state organizations and agencies servicing the population, i.e., health, educational, entertainment, and other such agencies." In addition, public consumption includes: consumption by public housing, utilities, personal transportation, communications, and the state. Other final demand consists of net accumulation of fixed capital, working capital, inventories, and state reserves; replacement of depreciated fixed capital and capital losses and capital repair; other expenditures and net exports.[16] We assume that both deliveries to public consumption and to other final demand are preponderantly producer durables. (This is an oversimplification because this definition of producer durables undoubtedly captures machinery that is uniquely military and any consumer durables that are exported.) We then are able to generate a set of value-added weights in each machinery sector for producer durables and consumer durables. The details of this procedure are described further in appendix B.

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[16] Treml, Gallik, Kostinsky, and Kruger, *Structure*, pp. 48-49. Also see Vladimir G. Treml, Dimtri M. Gallik, and Barry L. Kostinsky, "1966 Ex Post Input-Output Tables for the USSR: A Survey," Vladimir G. Treml, ed., *Studies in Soviet Input-Output Analysis*, (New York: Praeger Publishers, 1977), p. 9.

Table 3

Industry: 1970 Value Added at Factor Cost by Branch

	1970 Value Added by Branch at Factor Cost (billion rubles)[a]	Share of Industry Group (percent)[b]	Share of Industry (percent)[c]
Industrial Materials	**59.113**	**100.0**	**49.7**
Ferrous metals	8.793	14.9	7.4
Nonferrous metals	4.810	8.1	4.0
Fuel	12.070	20.4	10.1
Electric power	8.308	14.1	7.0
Chemicals	7.756	13.1	6.5
Wood, pulp, and paper	9.388	15.9	7.9
Construction materials	7.988	13.5	6.7
Machinery	**38.528**	**100.0**	**32.4**
Consumer nondurables	**21.404**	**100.0**	**18.0**
Light industry	9.761	45.6	8.2
Processed food	11.643	54.4	9.8
Subtotal	**119.045**		
Other industry	**3.564**		
Total industry	**122.609**		

[a] JEC, *GNP, 1950-80*. See table E-4. The groups—industrial materials and consumer nondurables—are sums of the branches directly below them.

[b] Each value added in column 2 divided by the appropriate group total.

[c] Value added in each branch and group divided by the subtotal for all industry. The effect of dividing by the subtotal is to allocate other industry proportionally among all of the branches.

The Index of Total Industrial Output

The calculation of indexes for the three major industry groups and for total industry can be summarized briefly. Since these indexes are used in estimating Soviet GNP within the framework of the GNP accounts maintained by the Office of Economic Research, we use the branch value added at factor cost in 1970 as weights instead of weights derived from input-output tables. The purpose of using factor cost instead of established prices for measuring value added is to count the true resource costs of production. The chief differences from an established price valuation are that factor cost subtracts taxes, adds subsidies, and imputes the costs of productive factors not appropriately accounted for by Soviet procedures, such as charges on fixed capital and working capital.[19] Table 3 shows these weights and the relative importance of each branch. The group and aggregate indexes are obtained by converting each branch index to a value-added basis and then summing the elements within each group and all industry.

Soviet Industrial Growth, 1950-80

Having described the methodology of the production index, we present the indexes and review some of the key developments in Soviet industry since 1950.

Revised SPIOER Indexes

The revised SPIOER indexes for the period 1950-80 are given in table 4 and the annual rates of growth in table 5. The average annual rates of growth for various quinquenniums are further summarized in table 6. The indexes for the individual input-output

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[19] See CIA, *USSR: Gross National Product Accounts, 1970*, pp. 1, 20, 85.

Table 4

1970 = 100

Soviet Industrial Production Indexes

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Industrial materials	21.61	24.24	26.37	28.66	31.81	35.53	38.52	42.07	46.43	50.89
Ferrous metals	22.63	25.57	29.08	31.91	34.79	38.32	41.21	43.66	46.61	50.67
Nonferrous metals	19.00	21.54	24.24	27.03	29.58	34.72	36.81	38.88	41.04	44.38
Fuels	24.03	26.25	28.05	29.99	33.07	37.63	41.77	46.57	50.87	54.45
Electric power	12.48	14.20	16.25	18.33	20.49	23.10	26.03	28.51	32.00	35.97
Chemicals and petrochemicals	13.03	14.31	15.61	17.22	19.59	22.52	25.26	27.65	31.02	33.72
Wood, pulp, and paper	40.37	45.80	47.60	49.63	54.66	57.65	59.70	63.91	69.87	76.29
Construction materials	14.18	16.13	18.19	21.22	24.73	29.37	32.61	37.88	45.19	52.00
Total machinery	21.61	23.73	25.78	28.07	30.60	34.20	36.67	39.16	42.10	45.89
Including:										
Producer durables	14.29	15.31	16.96	19.63	22.01	24.94	28.45	33.40	37.97	41.81
Consumer durables	9.97	11.00	12.60	15.23	18.27	22.54	24.86	27.12	29.53	33.33
Consumer nondurables	24.79	28.79	31.00	34.17	37.42	40.47	44.24	46.71	50.33	54.88
Light industry	27.79	32.66	34.75	38.06	42.55	45.59	48.28	50.51	54.53	58.70
Processed food	22.27	25.55	27.85	30.91	33.12	36.18	40.86	43.54	46.82	51.68
Total industry	22.18	24.90	27.01	29.46	32.42	35.99	38.95	41.96	45.73	49.99

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Industrial materials	54.38	57.71	61.56	65.82	70.59	75.47	80.16	85.51	89.80	93.60
Ferrous metals	55.15	59.83	64.42	68.43	73.42	78.11	82.94	87.63	91.62	94.82
Nonferrous metals	48.37	52.42	57.07	61.53	65.21	69.88	76.69	83.50	90.17	94.66
Fuels	57.73	60.56	64.06	69.44	73.95	78.31	83.33	87.69	90.77	94.76
Electric power	39.65	44.46	50.16	55.80	62.03	68.26	73.48	79.13	86.09	92.90
Chemicals and petrochemicals	37.13	40.82	45.12	49.98	56.85	65.32	71.85	79.02	84.67	89.82
Wood, pulp, and paper	76.40	76.29	78.09	81.38	85.07	86.77	87.17	91.52	93.71	95.37
Construction materials	58.27	62.57	65.77	67.60	70.88	75.76	81.22	86.97	90.36	92.16
Total machinery	50.07	54.30	59.84	63.67	67.75	71.48	74.72	79.72	86.90	92.88
Including:										
Producer durables	44.82	48.26	54.55	58.67	63.72	68.53	72.50	78.52	86.34	92.17
Consumer durables	37.00	41.10	45.61	49.74	54.01	58.52	64.90	72.96	81.99	90.73
Consumer nondurables	57.75	60.92	63.89	65.72	68.51	73.17	77.40	83.44	88.99	94.34
Light industry	62.07	64.34	66.56	67.47	69.47	70.70	75.96	82.26	88.75	94.40
Processed food	54.12	58.06	61.66	64.26	67.70	75.25	78.61	84.42	89.18	94.30
Total industry	53.59	57.18	61.42	65.11	69.30	73.77	77.90	83.26	88.72	93.50

Table 4 (continued) 1970 = 100

Soviet Industrial Production Indexes

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industrial materials	100.00	105.66	110.76	116.88	123.12	130.19	134.88	138.77	142.62	144.11	147.77
Ferrous metals	100.00	103.79	107.25	111.57	116.30	121.45	124.70	125.60	128.38	128.45	128.02
Nonferrous metals	100.00	107.02	112.72	119.56	126.92	132.89	137.08	141.26	145.90	150.22	151.43
Fuels	100.00	104.81	109.78	115.11	120.73	127.83	132.54	138.12	142.47	146.70	150.14
Electric power	100.00	108.12	115.80	123.62	131.88	140.58	150.29	155.65	162.90	167.68	175.26
Chemicals and petrochemicals	100.00	108.06	115.28	125.71	137.67	151.03	158.26	166.55	172.49	172.88	181.90
Wood, pulp, and paper	100.00	102.80	104.83	107.66	109.59	113.59	113.45	113.98	113.44	110.16	113.22
Construction materials	100.00	106.67	112.27	119.01	124.61	130.24	134.76	137.37	140.73	141.19	142.59
Total machinery	100.00	108.12	115.61	125.25	135.96	146.38	154.50	163.21	172.39	182.04	189.96
Including											
Producer durables	100.00	110.05	117.97	128.34	139.60	151.03	160.70	171.22	182.05	193.00	200.39
Consumer durables	100.00	112.62	128.14	144.86	159.91	173.85	184.68	197.98	214.65	224.14	232.72
Consumer non-durables	100.00	103.43	105.60	107.40	113.32	117.99	119.42	123.40	124.11	127.29	127.47
Light industry	100.00	104.48	105.26	108.24	111.11	114.30	119.05	122.06	125.21	127.41	129.96
Processed food	100.00	102.55	105.89	106.69	115.17	121.09	119.73	124.52	123.19	127.18	125.38
Total industry	100.00	106.06	111.40	117.88	125.51	133.24	138.45	143.92	148.93	153.36	157.77

sectors used for computing output for the branches and total industry appear in appendix table A-2.

Major Trends in Industrial Production

The postwar period of Soviet industrial growth falls naturally into three phases: an immediate postwar boom, a period of stable—but slowly declining—overall growth, and then a prolonged slowdown. These three phases are clear and pronounced for total industry and for industrial materials (figure 5). Machinery conforms to this pattern except in the middle phase. Its growth slows initially in the 1960s, as do the other groups, but growth then improves in the mid-1960s where it remains on a plateau until the third phase begins. Consumer nondurables also do not exhibit a stable middle phase, showing instead large growth fluctuations around a steadily declining trend.

The postwar industrial boom lasted through the 1950s with annual industrial growth ranging between 8 and 12 percent per year. As the Soviet economy rebuilt from the massive destruction of World War II, expansion focused on those industries most vital to the nation's investment programs—construction materials and machinery. Production of consumer nondurables generally grew more slowly even though production was at a low absolute level.

The early 1960s marked the beginning of a new phase in Soviet industrial development as growth slowed sharply in practically every branch. For the next decade and a half, the growth of total industrial

Table 5

Percent

Soviet Industrial Production: Annual Rates of Growth

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Industrial materials	12.2	8.8	8.7	11.0	11.7	8.4	9.2	10.4	9.6
Ferrous metals	13.0	13.7	9.7	9.0	10.1	7.6	5.9	6.8	8.7
Nonferrous metals	13.3	12.5	11.5	9.4	17.4	6.0	5.6	5.6	8.1
Fuels	9.2	6.9	6.9	10.3	13.8	11.0	11.5	9.2	7.0
Electric power	13.8	14.4	12.8	11.8	12.7	12.7	9.5	12.3	12.4
Chemicals and petrochemicals	9.8	9.1	10.3	13.8	14.9	12.2	9.5	12.2	8.7
Wood, pulp, and paper	13.4	3.9	4.3	10.1	5.5	3.6	7.0	9.3	9.2
Construction materials	13.7	12.8	16.7	16.5	18.8	11.0	16.2	19.3	15.1
Total machinery	9.8	8.6	8.9	9.0	11.8	7.2	6.8	7.5	9.0
Including:									
Producer durables	7.1	10.8	15.7	12.1	13.3	14.1	17.4	13.7	10.1
Consumer durables	10.3	14.6	20.9	20.0	23.3	10.3	9.1	6.9	12.9
Consumer nondurables	16.1	7.7	10.2	9.5	8.2	9.3	5.6	7.7	9.0
Light industry	17.5	6.4	9.5	11.8	7.1	5.9	4.6	8.0	7.6
Processed food	14.7	9.0	11.0	7.2	9.3	12.9	6.6	7.5	10.4
Total industry	12.2	8.5	9.1	10.1	11.0	8.2	7.7	9.0	9.3

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Industrial materials	6.9	6.1	6.7	6.9	7.2	6.9	6.2	6.7	5.0	4.2
Ferrous metals	8.8	8.5	7.7	6.2	7.3	6.4	6.2	5.7	4.6	3.5
Nonferrous metals	9.0	8.4	8.9	7.8	6.0	7.2	9.7	8.9	8.0	5.0
Fuels	6.0	4.9	5.8	8.4	6.5	5.9	6.4	5.2	3.5	4.4
Electric power	10.2	12.1	12.8	11.2	11.2	10.0	7.6	7.7	8.8	7.9
Chemicals and petrochemicals	10.1	9.9	10.5	10.8	13.7	14.9	10.0	10.0	7.2	6.1
Wood, pulp, and paper	0.1	−0.1	2.4	4.2	4.5	2.0	0.5	5.0	2.4	1.8
Construction materials	12.1	7.4	5.1	2.8	4.8	6.9	7.2	7.1	3.9	2.0
Total machinery	9.1	8.5	10.2	6.4	6.4	5.5	4.5	6.7	9.0	6.9
Including:										
Producer durables	7.2	7.7	13.0	7.5	8.6	7.5	5.8	8.3	10.0	6.8
Consumer durables	11.0	11.1	11.0	9.1	8.6	8.4	10.9	12.4	12.4	10.7
Consumer nondurables	5.2	5.5	4.9	2.9	4.2	6.8	5.8	7.8	6.7	6.0
Light industry	5.7	3.6	3.5	1.4	3.0	1.8	7.4	8.3	7.9	6.4
Processed food	4.7	7.3	6.2	4.2	5.3	11.2	4.5	7.4	5.6	5.7
Total industry	7.2	6.7	7.4	6.0	6.4	6.5	5.6	6.9	6.5	5.4

Table 5 (continued) Percent

Soviet Industrial Production: Annual Rates of Growth

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Industrial materials	6.8	5.7	4.8	5.5	5.3	5.7	3.6	2.9	2.8	1.0	2.5
Ferrous metals	5.5	3.8	3.3	4.0	4.2	4.4	2.7	0.7	2.2	0	−.3
Nonferrous metals	5.6	7.0	5.3	6.1	6.2	4.7	3.1	3.1	3.3	3.0	0.8
Fuels	5.5	4.8	4.7	4.9	4.9	5.9	3.7	4.2	3.1	3.0	2.3
Electric power	7.6	8.1	7.1	6.8	6.7	6.6	6.9	3.6	4.7	2.9	4.5
Chemicals and petrochemicals	11.3	8.1	6.7	9.0	9.5	9.7	4.8	5.2	3.6	0.2	5.2
Wood, pulp, and paper	4.9	2.8	2.0	2.7	1.8	3.6	−0.1	0.5	−0.5	−2.9	2.8
Construction materials	8.5	6.7	5.2	6.0	4.7	4.5	3.5	1.9	2.4	0.3	1.0
Total machinery	7.7	8.1	6.9	8.3	8.5	7.7	5.5	5.6	5.6	5.6	4.4
Including:											
Producer durables	8.5	10.1	7.2	8.8	8.8	8.2	6.4	6.5	6.3	6.0	3.8
Consumer durables	10.2	12.6	13.8	13.0	10.4	8.7	6.2	7.2	8.4	4.4	3.8
Consumer nondurables	6.0	3.4	2.1	1.7	5.5	4.1	1.2	3.3	0.6	2.6	0.1
Light industry	5.9	4.5	0.7	2.8	2.7	2.9	4.2	2.5	2.6	1.8	2.0
Processed food	6.0	2.6	3.3	0.8	7.9	5.1	−1.1	4.0	−1.1	3.2	−1.4
Total industry	7.0	6.1	5.0	5.8	6.5	6.2	3.9	4.0	3.5	3.0	2.9

production remained fairly stable at around 6 percent, although it trended slightly downward. During this period of apparent industrial consolidation, machinery production continued to drive overall industrial growth. Growth in industrial materials and consumer nondurables was generally slower and showed a stronger downward slide.

While all signs suggest that the growth of industrial production slowed considerably after the 1950s, the extent and suddenness of the decline in the indexes may be deceptive. One likely cause of the sudden slowdown is the decline in the workweek from 46 to 41 hours by 1960. Thus, even with a 4.4-percent increase in industrial employment in 1960, labor inputs increased only 0.5 percent.[20] Considering that the Soviets historically have achieved growth by the infusion of new inputs, it is not surprising that growth slowed. A lesser possibility, is that statistical reporting practices may have tightened after the 1950s to reduce the inflation of reported output in later reporting periods.[21]

The current phase of industrial slowdown began in the mid-1970s when growth of machinery production started to falter and machinery production could no longer offset the gradual slowdown in the growth of materials and nondurables. This slowdown reflects the slowing growth in the industrial labor force, a continuing failure to assimilate new production capacity

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[20] Steven Rapawy, *Estimates and Projections of the Labor Force and Civilian Employment in the U.S.S.R. 1950 to 1990*, Foreign Economic Report Number 10, (Washington: U.S. Department of Commerce, September 1976), p. 43. The data presented were revised and updated in February 1980.

[21] For a discussion of the padding of Soviet output statistics, see Gregory Grossman, *Soviet Statistics of Physical Output of Industrial Commodities*, (Princeton: Princeton University Press, 1960), and Alec Nove, "A Note on the Availability and Reliability of Soviet Statistics," in Morris Bornstein and Daniel R. Fusfeld, ed., *The Soviet Economy: A Book of Readings* (fourth edition; Homewood, Illinois: Richard D. Irwin, Inc., 1974), pp. 237-245.

Table 6 Percent

Soviet Industrial Production: Average Annual Rates of Growth

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Industrial materials	10.5	8.9	6.8	5.8	5.4	2.6
Ferrous metals	11.1	7.6	7.2	5.1	4.0	1.1
Nonferrous metals	12.8	6.9	7.6	7.4	5.9	2.6
Fuels	9.4	8.9	6.3	5.0	5.0	3.3
Electric power	13.1	11.4	11.5	7.9	7.0	4.5
Chemicals and petrochemicals	11.6	10.5	12.0	8.9	8.6	3.8
Wood, pulp, and paper	7.4	5.8	2.6	2.9	2.6	−0.1
Construction materials	15.7	14.7	5.4	5.7	5.4	1.8
Total machinery	9.6	7.9	7.4	6.9	7.9	5.4
Including:						
Producer durables	11.8	12.4	8.9	7.8	8.6	5.8
Consumer durables	17.7	10.4	9.6	11.3	11.7	6.0
Consumer nondurables	10.3	7.4	4.8	6.4	3.4	1.6
Light industry	10.4	6.4	2.6	7.2	2.7	2.6
Processed food	10.2	8.4	6.8	5.9	3.9	0.7
Total industry	10.2	8.3	6.6	6.3	5.9	3.4

on time, declining capital productivity, and little success in boosting worker productivity. The result has been the low rates of industrial growth in recent years.

The decline in growth is continuing. The USSR faces severe strains because of deceleration in the growth of available inputs—especially fuels, minerals, and labor.[22] The lack of success in boosting productivity during the 10th Five-Year Plan suggests that the Soviets will be hard pressed to offset tightening input bottlenecks.

Since 1950 some evolution of the industrial structure has occurred:

Estimated Share of Industrial Value Added, 1967 Prices Percent

	1950	1980
Industrial materials	48.4	46.5
Total machinery	31.5	39.0
Consumer nondurables	20.1	14.5

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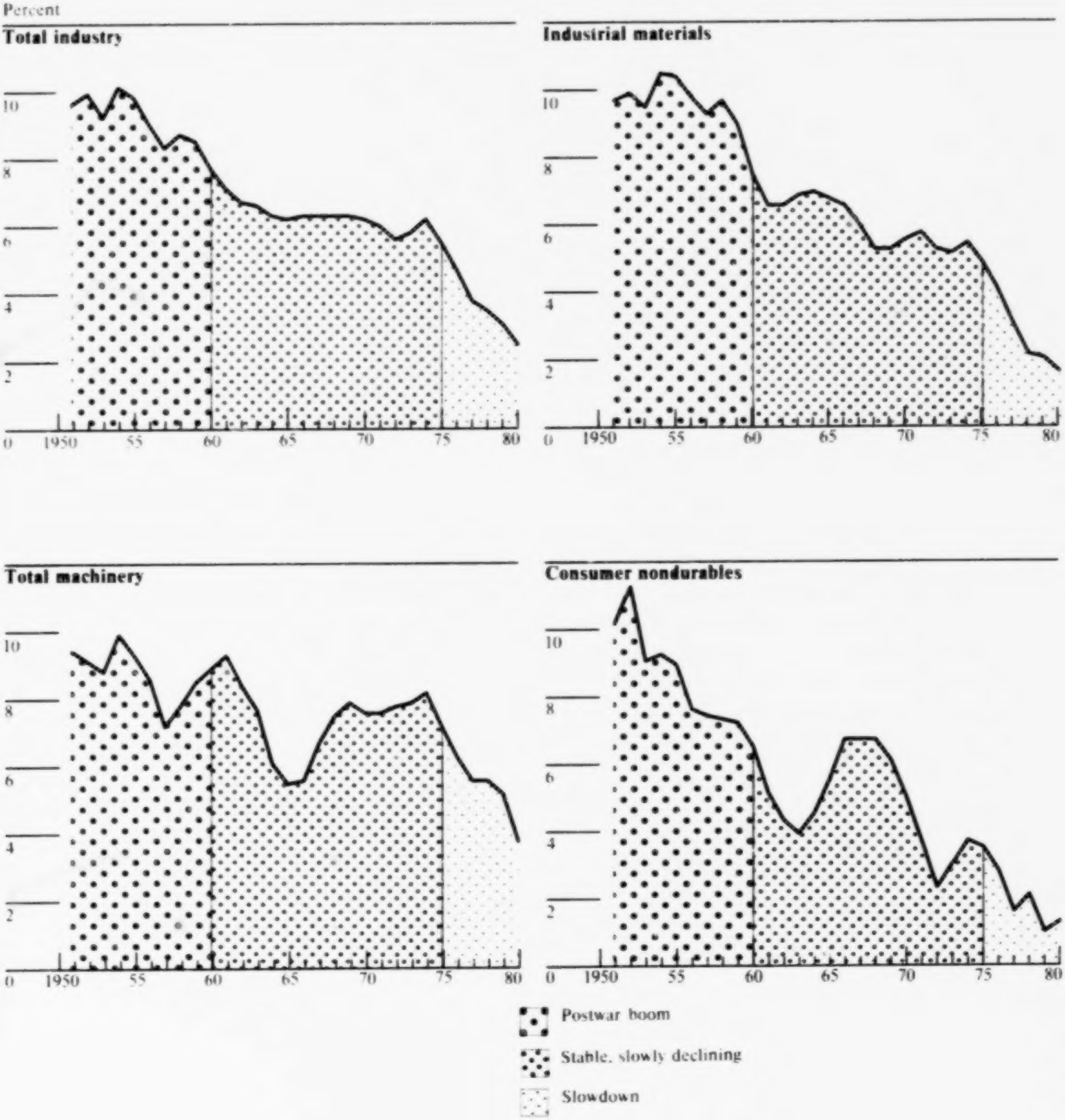
[22] See CIA, *Soviet Economic Problems and Prospects*, ER 77-10536 U (July 1977).

Figure 5
Growth of Soviet Industrial Production
Three-year moving average


Total industry

Industrial materials

Total machinery

Consumer nondurables

In 30 years, the share of industrial materials has dropped by only 2 percentage points. Machinery's share of the industrial pie has expanded by 8 percentage points until now where it represents nearly two-fifths of industrial production. It comes as no surprise, however, that this growing share comes mostly at the expense of consumer nondurables.

Industrial Materials. During the overall decline in the growth of the production of industrial materials (from 10.5 percent per year in 1951-55 to 2.6 percent per year in 1976-80) the relative growth positions of the branches in the group changed markedly. At first, construction materials, electric power, and nonferrous metals were the fastest growing branches in the industrial materials group as well as in all of industry. The dramatic growth of these three branches stemmed from the needs of postwar reconstruction and the rapid arms buildup during the Cold War. Chemicals and ferrous metals were also leading sectors in the early 1950s; fuels and wood, pulp, and paper products were at the bottom. In the last half of the decade, construction materials and electric power maintained their strong growth positions and were joined by chemicals. Meanwhile, both metals branches slipped into the slow growth group.

Since the early 1960s, the chemicals branch has become the fastest growing branch in all industry, followed by electric power and a resurgent nonferrous metals branch. Meanwhile, construction materials, fuels, ferrous metals, and wood, pulp, and paper branches have continued to grow below the average for the industrial materials groups as a whole.

The years 1976-80 were particularly disastrous for industrial materials. Growth in every branch of materials fell to record lows. Chemicals lost its position as growth leader to the machinery branch. As an example of the widespread slowdown, electric power became the fastest growing component of industrial materials even though its growth was only two-thirds of the rate achieved from 1971 to 1975.

Machinery. The machinery branch has been the fastest growing component of industrial production for most of the 1960-80 period and has been perhaps the most dynamic element in the entire economy. Machinery experienced a sharp decline in growth in the early 1960s along with the rest of industry. It rebounded during the rest of the decade and into the 1970s, when it too began to share in the current decline.

During much of the postwar era, the growth of consumer durables output has outpaced producer durables—partly because it started from an extremely low base. The changing composition of consumer durables production has also helped to generate strong growth rates.[21] In the 1950s consumer durables production was so primitive that products such as kitchen utensils and small electrical appliances accounted for the bulk of the growth. In the 1960s larger appliances—televisions, refrigerators, and washing machines—began to drive consumer durables output. Early in the 1970s output of automobiles sold to consumers also began to grow rapidly. In the past few years, however, the growth of automotive production has tailed off, and consumer durables growth has approached that of producer durables. Some of this deceleration may reflect strained supplies of ferrous metals, which also support investment and the production of military hardware.

Production of producer durables grew rapidly during the postwar boom—even accelerating for a long time—as capital stock throughout the economy was replenished and expanded. Practically every machinery component except that destined for consumer-related industries shared in the revival. Toward the end of the 1950s, growth of producer durables output dropped sharply across the board, except for agricultural machinery whose output expanded in the early 1960s. From the late 1960s until the beginning of the current period of slowdown, growth picked up slightly as investment expanded. During this period somewhat more resources were devoted to machinery for consumer industries, precision instruments, motor vehicles, and agricultural machinery. In the 1970s, producer durables growth has slowed with the rest of industry, especially the production of motor vehicles, freight cars, agricultural machinery, instruments, and equipment for consumer industries.

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[21] For an early discussion of the different phases of consumer durables output when the product composition changed significantly, see Marshall I. Goldman, "The Reluctant Consumer and Economic Fluctuations in the Soviet Union," *Journal of Political Economy*, (August 1965), pp. 366-380.

Consumer Nondurables. Light industry and processed food generally have been the slowest growing branches of industry. Production of consumer goods traditionally has not had the highest priority, and production of consumer nondurables by its very nature reflects performance in the trouble-plagued agricultural sector.

Although both processed food and light industry fared well during the early boom period, output was still at extremely low levels. Both branches experienced a sharp decline in growth during the early 1960s, with the burden felt most severely by light industry. This decline reflected both a diversion of investment resources away from the consumer branches and relatively poor agricultural performance during 1961-64. By the middle of the decade, the growth of nondurables accelerated somewhat as crops improved and the increased production of machinery for consumer industries began to have an impact on output. Light industry especially profited from this shift that temporarily allowed consumer nondurables to grow faster than the industrial average.

After the peak growth of nondurables output recorded in 1967, growth again trended sharply downward. Light industry fell back to its usual low growth patterns after the initial surge of new capital stock had worked its way through the system. The poor agricultural performance of the 1970s hampered processed food production: after the 1975 crop failure, processed food production declined absolutely in 1976, for the first time in the post-Stalin era. In addition, output in this branch declined twice more during the 10th Five-Year Plan.

Evaluation of the New Indexes

Since SPIOER was developed because the official industrial production indexes released by the CSA are unreliable, we need to judge the degree of improvement that SPIOER represents. We examine the synthetic indexes from several perspectives. One criterion is for consistency with the official data. Although the official indexes are unreliable growth measures, the SPIOER and official indexes should at least agree on the configuration of trends, and the indexes should at least roughly correspond regarding the relative growth among sectors. In addition, these indexes should satisfactorily remove the growth distortions; we would expect that generally the SPIOER growth rate should fall below the official rates. A second criterion is for the product sample to be representative of total industrial output. Although the inclusion in the sample of a large share of industrial product should help satisfy this standard, this does not guarantee that the sample will move as total industrial output especially if the material intensity of production has changed over time. According to a third criterion, any biases in the basic data should be minimal or at least partially offsetting. In this section of the paper, the SPIOER indexes are subjected to a series of tests to determine how well they satisfy the criteria of consistency, representativeness, and minimal bias.

Consistency Tests

Consistency With the Official Indexes. Consistency first implies that both sets of indexes—synthetic and official—should show roughly similar relative rates of growth among the branches of industry. Where differences arise in the fastest or slowest growth sectors, there should be a plausible explanation.

To test this property, average annual rates of growth were computed for six periods for every branch of industry for both SPIOER and the official indexes.[24] For each five-year period the branches were ranked

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[24] The nonferrous metals branch was excluded from this and other tests because the CSA does not publish an appropriate index for that branch.

Table 7

Rankings of Industrial Branches by Growth Rates

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Ferrous metals						
SPIOER	4	7	4	7	6	7
Official	6	5	5	7	8	7
Fuels						
SPIOER	8	4	6	8	5	4
Official	7	6	7	7	5	5
Electric power						
SPIOER	2	2	2	2	3	2
Official	4	3	3	3	4	3
Chemicals and petrochemicals						
SPIOER	3	3	1	1	1	3
Official	2	4	1	1	2	2
Wood pulp, and paper						
SPIOER	9	9	9	9	9	9
Official	9	8	8	9	7	9
Construction materials [a]						
SPIOER	1	1	7	6	4	6
Official	1	1	4	4	3	6
Machinery						
SPIOER	7	6	3	4	2	1
Official	3	2	2	2	1	1
Light industry						
SPIOER	5	8	8	3	8	5
Official	5	9	9	5	9	4
Processed food						
SPIOER	6	5	5	5	7	8
Official	8	7	6	6	6	8
Spearman's Rank Correlation Coefficient [b]	0.75	0.73	0.87	0.88	0.88	0.97
Sum of Squared Differences [c]	30	32	16	16	14	4

[a] For the official series, the construction materials branch is a combination of the published construction materials and glass and porcelain indexes.

[b] Freund, *Modern Elementary Statistics*, pp. 364-366.

[c] The sum of squared differences derived in the Spearman Rank Order Correlation test is significant at 99-percent level of confidence if the value is less than 20. For a discussion of the significance test, see James V. Bradley, *Distribution-Free Statistical Tests*, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1968), pp. 93-95, 314.

by growth rates. A statistical test was then performed using Spearman's rank correlation coefficient to determine the degree of agreement in branch growth rankings between the SPIOER and official indexes.[29] The results are summarized in table 7. The sum of squared differences indicate that the rank correlation coefficients for the 1960s and 1970s are significant at the 99-percent confidence level—strong statistical evidence that both SPIOER and official branch indexes exhibit similar relative growth. The 1950s are a different matter, however, as the correlation is not significant at this level of confidence. The source of this insignificance is the wide disagreement over the machinery rankings. Both quinquenniums in the 1950s give machinery a rank four places higher in the official indexes than in the SPIOER versions. Perhaps disguised inflation operated at higher rates then than in the later periods. In every five-year period except 1971-75, both indexes agree on the most rapidly growing branch; in the one exception, the fastest growing branch in the SPIOER series is ranked second in the Soviet data. Moreover, in nearly every case the slowest growing branch in one set of indexes matches either the slowest or next slowest in the other. The largest divergence in rankings occurs during the 1950s, the smallest deviation during the most recent quinquennium.

Since the beginning of the 1960s the major incongruities have involved construction materials and machinery. The official series generally ascribe a higher rank to these two branches. In the case of construction materials, double-counting seems to have increased over the years, causing the growth of gross value of construction materials measured by the official data to be more rapid than our estimated growth of output. The increase in double-counting results partly from a conscious drive to "industrialize" construction. (See earlier discussion.)

The machinery anomaly occurs because machinery is probably the branch most susceptible to the problems of new-product pricing. The official machinery index becomes an uncertain amalgamation of constant prices and current prices—the latter tending to rise over time. The official machinery index inflated by so-called new product prices grows more rapidly than the SPIOER output indexes, so machinery tends to rank higher in the official series.

Plausible Elimination of Inflated Growth. The official indexes are unacceptable because of the twin biases of new-product pricing and double-counting that exaggerate growth according to most Western observers and even some Soviet ones. If the SPIOER indexes are to be plausible measures of industrial growth, the difference between the SPIOER and official rates should be largest for those branches of industry most susceptible to upward bias—machinery, chemicals, and construction materials. The average annual rates of growth for both the official and SPIOER series are shown in table 8 for each quinquennial period since 1950. The SPIOER growth rate is less than the official rate in each comparison period for total industry and for the individual branches with the exception of fuels (1956-60 and 1976-80) and processed food (1951-55 and 1956-60). The largest reductions in growth occur in those industries with the most severe new product pricing and double-counting problems: machinery, chemicals, and construction materials (table 9).

All of these tests of SPIOER's consistency with the official index have considered only multiyear periods. A year-by-year comparison for total industry (table 10 and figure 6) shows that the SPIOER growth rate is less than the official rate for every year.

Thus, to the extent that the SPIOER methodology is designed to avoid the growth distortions in the official series, it seems to do so. In most cases the rate of growth measured by SPIOER falls below the rate claimed in the official Soviet measures. Moreover, SPIOER reduces the rate of growth most in those branches—machinery, chemicals, and construction materials—most afflicted by new-product pricing and increased double-counting.

Consistency of Growth Trends. A third consistency test compares the aggregate and branch growth trends measured by the SPIOER and official indexes. The SPIOER indexes should agree in general with the

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[29] See John E. Freund, *Modern Elementary Statistics*, (3rd Edition; Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1967), pp. 364-366.

Table 8 Percent

Comparisons of Average Annual Growth in SPIOER and Official Series

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Total industry						
SPIOER	10.2	8.3	6.6	6.3	5.9	3.4
Official	13.1	10.4	8.6	8.4	7.5	4.4
Ferrous metals						
SPIOER	11.1	7.6	7.2	5.1	4.0	1.1
Official	12.1	8.8	8.0	5.7	5.0	1.9
Fuels						
SPIOER	9.4	8.9	6.3	5.0	5.0	3.3
Official	10.1	8.5	6.5	5.7	5.1	2.9
Electric power						
SPIOER	13.1	11.4	11.5	7.9	7.0	4.5
Official	14.4	13.1	12.3	9.0	7.1	5.0
Chemicals and petrochemicals						
SPIOER	11.6	10.5	12.0	8.9	8.6	3.8
Official	17.3	12.0	14.4	12.2	10.6	5.7
Wood, pulp, and paper						
SPIOER	7.4	5.8	2.6	2.9	2.6	−0.1
Official	8.3	7.8	5.0	5.5	5.2	1.5
Construction materials						
SPIOER	15.7	14.7	5.4	5.7	5.4	1.8
Official	17.6	17.6	9.1	8.6	7.5	2.5
Machinery						
SPIOER	9.6	7.9	7.4	6.9	7.9	5.4
Official	16.7	14.2	12.4	11.7	11.6	8.2
Light industry						
SPIOER	10.4	6.4	2.6	7.2	2.7	2.6
Official	12.3	6.9	2.6	8.6	4.6	3.4
Processed food						
SPIOER	10.2	8.4	6.8	5.9	3.9	0.7
Official	10.0	7.9	7.2	5.9	5.4	1.5

trends of the official indexes with respect to relative growth in different periods unless official series give a totally distorted view of the pattern of growth over time.

For example, a test for secular consistency might compare growth in the fifties with that in the seventies. A radical divergence between the SPIOER and the official indexes with respect to the pattern of Soviet development would throw considerable doubt on the synthetic indexes. We expect that even though the official indexes are biased, they nonetheless reflect actual growth trends.

To perform this test, we first compute the average annual rate of growth for 1951-80 and then several multiyear periods within that span for both SPIOER and the official series. These period growth rates are indexed relative to the historical average for that branch to then test both series for similar long-term

Table 9 Percentage Points

Difference Between Official and SPIOER Average Annual Growth Rates for Industry and Branches of Industry [a]

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Total industry	2.9	2.1	2.0	2.1	1.6	1.0
Ferrous metals	1.0	1.2	0.8	0.6	1.0	0.8
Fuels	0.7	−0.4	0.2	0.7	0.1	−0.4
Electric power	1.3	1.7	0.8	1.1	0.1	0.5
Chemicals and petrochemicals	5.7	1.5	2.4	3.3	2.0	1.9
Wood, pulp, and paper	0.9	2.0	2.4	2.6	2.6	1.6
Construction materials	1.9	2.9	3.7	2.9	2.1	0.7
Machinery	7.1	6.3	5.0	4.8	3.7	2.8
Light industry	1.9	0.5	0.0	1.4	1.9	0.8
Processed food	−0.2	−0.5	0.4	0.0	1.5	0.8

[a] These numbers represent the average annual percentage rate of growth for the official series less the SPIOER rates. Thus, a positive value indicates that SPIOER has a lower growth rate, while a negative one implies the opposite.

movements. Interpretation of the test results is complicated because growth consistency can be assessed on at least four different planes, none of which is necessarily preferred. Maximum consistency between SPIOER and the official indexes is not necessarily optimal, since a trade-off exists between the accuracy of the SPIOER indexes and their consistency with the official indexes. As the degree of SPIOER's consistency with the official indexes increases, eventually a point is reached where greater consistency implies mere replication of the growth distortions in the official indexes.

A minimal interpretation of growth consistency requires simply that the SPIOER and official growth indexes agree on the above- or below-average years. Another interpretation of consistency is that the SPIOER and official indexes agree regarding the extremes, the periods of highest and lowest growth. A level of consistency even more difficult to achieve is that the growth rates of the SPIOER indexes and the official series move in the same direction from one period to the next. However, seeking consistency here risks forcing the inaccuracies of the official series onto the synthetic indexes. The highest degree of consistency (in some cases undesirable) requires that the values of the indexed growth rates be nearly equal for a given period. Failure to ensure this highly rigid form of consistency is not critical, unless we assert that the amount of distortion in the official indexes remains unchanged from year to year.

When the test results are interpreted from the standpoint of the agreement on above- and below-average years—whether the growth indexes are above or below 100—the SPIOER indexes do quite well (table 11). In only two out of 60 possible instances do the SPIOER and official indexes clearly disagree in assigning above- or below-average performance to a given period. In the two exceptions—chemicals and petrochemicals in 1966-70 and machinery in 1971-75—only marginal changes in the index would remove the inconsistency.

The consistency of SPIOER and official indexes with respect to the identification of the periods of highest and lowest growth is quite good. SPIOER estimates agree with the official indexes on the high growth

Table 10

Difference Between Official and SPIOER Growth Rates for Industry

	Official [a] (percent)	SPIOER (percent)	Difference [b] (percentage point)
1951	16.4	12.2	4.2
1952	11.6	8.5	3.1
1953	12.0	9.1	2.9
1954	13.3	10.1	2.2
1955	12.5	11.0	1.5
1956	10.6	8.2	2.4
1957	10.0	7.7	2.3
1958	10.3	9.0	1.3
1959	11.4	9.3	2.1
1960	9.5	7.2	2.3
1961	9.1	6.7	2.4
1962	9.7	7.4	2.3
1963	8.1	6.0	2.1
1964	7.3	6.4	0.9
1965	8.7	6.5	2.2
1966	8.7	5.6	3.1
1967	10.0	6.9	3.1
1968	8.3	6.5	1.8
1969	7.1	5.4	1.7
1970	8.5	7.0	1.5
1971	7.7	6.1	1.6
1972	6.5	5.0	1.5
1973	7.5	5.8	1.7
1974	8.0	6.5	1.5
1975	7.5	6.2	1.3
1976	4.8	3.9	0.9
1977	5.7	4.0	1.7
1978	4.8	3.5	1.3
1979	3.4	3.0	0.4
1980 [c]	3.6	2.9	0.7

[a] Central Statistical Agency, *Narkhoz 78, 79, and 80,* (Moscow: Statistika, 1979, 80, and 81) p. 38.

[b] This is the annual growth rate of the official series less the SPIOER rates. Thus, a positive value indicates that SPIOER has reduced the growth rate while a negative one implies the opposite.

[c] Preliminary.

period for total industry and eight out of nine branches and on the low growth period for all indexes. Only a minor shift would lead to perfect consistency at this level. A change in average growth rate of only 0.4 percentage point would bring the series for chemicals into conformity on the best growth periods.

The secular consistency of SPIOER with respect to comparable period-to-period growth trends is surprisingly good. Table 12 summarizes the directional structure of the two growth index series. A negative sign indicates that growth has slowed while a positive one signifies an acceleration. When both signs match during a given period, the two indexes agree that growth has accelerated or decelerated. Of the 50 possible comparisons between the two sets of indexes, they agree on directional trend 45 times.[26] Three of the five inconsistencies occur in the two branches of industry—construction materials and machinery—with the least reliable official output indexes.

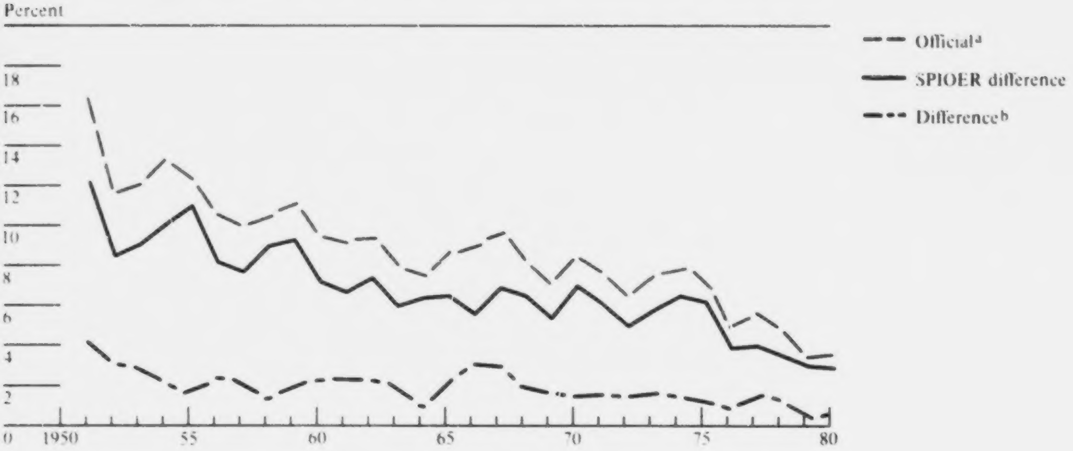
Consistent agreement on relative deviations of subperiod growth rates from the 1950-80 average is hard to interpret in terms of the reasonableness of the synthetic series because relative bias in either the official indexes or SPIOER may change. In any case the performance of SPIOER is mixed in this sort of comparison. In some cases—such as total industry, electric power, ferrous metals, and fuels—agreement is good on the pattern of growth. In others—like wood, pulp, and paper and construction materials—the magnitudes of growth shifts are very different in the two series. Therefore, SPIOER gives a somewhat different picture of the pattern of development in these latter branches.

Consistency With Investment Series. Another way to test the representativeness of the producer durables sample is to compare this index with the official series

[26] The test treats a result of no trend in one series versus some trend in the other as no match.

Figure 6

SPIOER and Official Series: Comparison of Annual Growth Rates for Industry



[a] Narkhoz

[b] This is the annual growth rate of the official series less the SPIOER rates

for the machinery and equipment component of investment since investment goods make up the major portion of producer durables. The official series for investment in machinery should be comprehensive with each individual product valued at its own price (unlike SPIOER's index for producer durables production, which is based on a sample).

Before performing the comparison the investment series must be adjusted to a production basis. Machinery does not appear in the investment data as soon as it is produced. In addition, some allowance must be made for foreign trade. Domestically produced machinery that is exported never appears in the investment data. Likewise, imported machinery appears in the investment data, but is never reflected in the production data.

Given the frequent delays in the construction industry, we assume that on average production or imports of machinery are reflected in investment after a year's lag.

$$\text{Implied Production}_t = \text{Investment}_{t+1} - \text{Net Imports}_t$$

The investment series so adjusted is compared with the SPIOER producer durables series in figure 7.[27]

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[27] Foreign trade in machinery and equipment is reported in *Vneshnyaya torgovlya SSSR* in current foreign trade rubles; in contrast the investment series is reported in constant estimate prices of 1969. The foreign trade data are adjusted in the following way. First, net imports of machinery and equipment are computed in current foreign trade rubles. Second, a price index for imports is derived by comparing the relative growth of two series for total imports—one in comparable prices and the other in current prices. This implicit price index is used to deflate machinery imports, even though it is based on all imports, including non-machinery products. Hence some possible error is introduced by this procedure unless machinery prices have moved in the same pattern as all import prices. Finally, net imports of machinery and equipment in constant prices are adjusted to domestic prices by using a coefficient of 0.978 estimated by Vladimir Treml for 1972. Although the assumptions used to make the foreign trade data comparable with the investment data may be tenuous, machinery imports are a small share of investment.

Table 11

SPIOER and Official Industrial Indexes: Comparisons of Secular Growth Patterns [a]

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Ferrous metals						
SPIOER	188	129	122	86	68	19
Official	175	128	116	83	74	28
Fuels						
SPIOER	149	141	100	79	79	52
Official	153	129	98	86	89	44
Electric power						
SPIOER	142	124	125	86	76	49
Official	143	130	122	89	70	50
Chemicals and petrochemicals						
SPIOER	126	114	130	97	93	41
Official	144	100	120	102	88	48
Wood, pulp, and paper						
SPIOER	211	166	74	83	74	−3
Official	151	142	91	100	95	27
Construction materials						
SPIOER	196	184	68	71	68	22
Official	169	169	88	83	72	24
Machinery						
SPIOER	128	105	99	92	105	72
Official	135	115	100	94	94	66
Light industry						
SPIOER	196	121	49	136	51	49
Official	192	108	41	134	72	53
Processed food						
SPIOER	173	142	115	100	66	12
Official	159	125	114	94	86	28
Total industry						
SPIOER	150	122	97	93	87	50
Official	151	120	99	97	86	51

[a] Each value is the ratio of the period average to the postwar average.

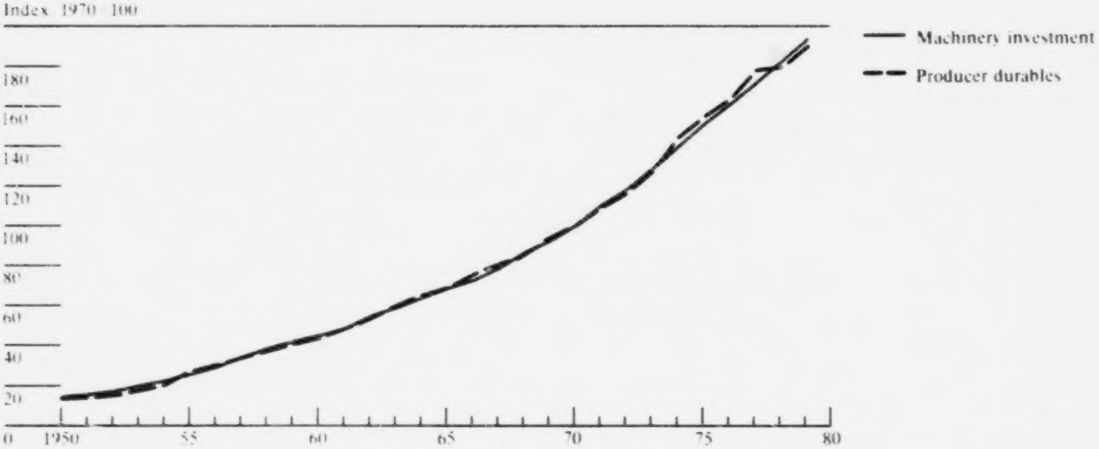
Table 12

SPIOER and Official Industrial Indexes: Directional Changes in Growth

	From (1951-55) to (1956-60)	From (1956-60) to (1961-65)	From (1961-65) to (1966-70)	From (1966-70) to (1971-75)	From (1971-75) to (1976-80)
Ferrous metals					
SPIOER	–	–	–	–	–
Official	–	–	–	–	–
Fuels					
SPIOER	–	–	–	0	–
Official	–	–	–	+	–
Electric power					
SPIOER	–	+	–	–	–
Official	–	–	–	–	–
Chemicals and petrochemicals					
SPIOER	–	+	–	–	–
Official	–	+	–	–	–
Wood, pulp, and paper					
SPIOER	–	–	+	–	–
Official	–	–	+	–	–
Construction materials					
SPIOER	–	–	+	–	–
Official	+	–	–	–	–
Machinery					
SPIOER	–	–	–	+	–
Official	–	–	–	–	–
Light industry					
SPIOER	–	–	+	–	–
Official	–	–	+	–	–
Processed food					
SPIOER	–	–	–	–	–
Official	–	–	–	–	–
Total industry					
SPIOER	–	–	–	–	–
Official	–	–	–	–	–

Figure 7

Comparison of Production of Producer Durables and Adjusted Investment



The close correspondence between the two series over the postwar period suggests that the producer durables sample is representative of the total output of this type of machinery. When examining growth rates instead of indexes, as shown in the tabulation below, the relationship between the two series does not appear quite as close:

Average Annual Growth of Adjusted Machinery Investment and Producer Durables Percent

	Adjusted Machinery Investment	SPIOER Producer Durables
1951-55	14.6	11.8
1956-60	10.0	12.4
1961-65	9.6	8.9
1966-70	7.7	7.8
1971-75	9.1	8.6
1976-79	5.2	6.3
1951-79	9.5	9.4

In some periods the two series diverge substantially in terms of average annual rates of growth. Both series grew at about the same rate from 1950 to 1979.

The machinery investment series may also be susceptible to the effects of new-product pricing and hence disguised inflation. Thus, the close relationship could mean that the producer durables index has not successfully removed all traces of disguised inflation and has some upward bias.

Sample Representativeness

Sample Coverage. A statistical sample should at least include enough items to ensure that the characteristics of the sample approach those of the total. In general, the larger the sample's share of the total, the greater the likelihood that its characteristics are similar to those of the full population.[28]

Using the 1972 input-output table as a point of reference enables us to measure the sample coverage and to identify those areas of industry where a relatively small sample threatens the accuracy of the indexes. If we sum the value of all the products within each sector's sample for 1972 and compare this with the reported GVO in the input-output table, we get a rough notion of the percentage of industrial output covered by SPIOER, at least for that year. The measure is rough because differences in accounting practices and pricing make the industrial sample and the input-output table incompatible in some respects. For example, the production of commodities published in physical units includes intraplant turnover, but the value of production as reported in the input-output table presumably removes intraplant turnover in measuring gross output.[29] Production data expressed as a CSA index and perhaps as a value series are also usually reported on an establishment basis, and the input-output data are compiled on a commodity basis. A commodity-based classification scheme rebases the secondary production of an enterprise to the industry to which it ostensibly should belong, but establishment-based classification makes no attempt at such a correction.[30] Another important difference is the SPIOER sample's use of 1 July 1967 prices and the input-output table's use of 1972 prices. To the extent that there has been inflation—concealed or otherwise—our estimated sample coverage may be understated.

In SPIOER's coverage of industrial production, 87 percent of the industrial sectors reported in the reconstructed 1972 input-output table have some form of representation in the sample (table 13). The machinery branch has the most sectors and also the most gaps in coverage, although the missing sectors are relatively unimportant. Of the represented sectors the median coverage is 71 percent with the degree of coverage ranging from 8 percent in one machinery sector to more than 100 percent in certain sectors in the construction materials, light industry, and processed food branches.[31] Coverage in four of 10 branches is more than 70 percent, and all but two have at least 50-percent coverage. The most restricted samples are found in nonferrous metals (29 percent) and chemicals (42 percent); statistics on production of nonferrous metals and many chemicals are considered classified by Soviet authorities and hence are not reported. Machinery coverage would have been low—about one-half—except that we added our estimates of military machinery to the value of the sample. Overall in this benchmark year the SPIOER sample accounted for about 60 percent of Soviet industrial production.

A Rough Measure of Sample Representativeness. The fact that SPIOER product samples represent substantial shares of total output in 1972 does not guarantee that the samples are representative in terms of their growth. The best available benchmarks of representativeness are the various input-output tables. One rough measure can be performed computing gross value of output in current rubles from the 1959, 1966, and 1972 input-output tables for 10 branches of

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[28] A large share—but less than 100 percent—does not ensure that the sample represents the total if the products included are atypical. For example, Soviet production data may be upward biased because the CSA publishes only data that reflect favorably on Soviet accomplishments. On the other hand, some published data understate growth because the Soviets generally measure output in natural units, like the number of bulldozers. Such treatment fails to capture changes in product assortment and quality. Therefore, because of the peculiarities of Soviet data, a large sample share does not guarantee the representativeness of the sample.

[29] *Narodnoye khozyaystvo v 1973 g.*, p. 580 and Treml, Gallik, Kostinsky, and Kruger, *Structure*, pp. 46-47. Also see the earlier discussion of gross output measures in this paper.

[30] Treml, Gallik, Kostinsky, and Kruger, *Structure*, pp. 123-146.

[31] The sectors where this occurs are: logging (115 percent), cement (106 percent), concrete (106 percent), asbestos cement (118 percent), linen (159 percent), hosiery and knitwear (125 percent), flour and cereal (142 percent), and fruit and vegetables (155 percent). There are several possible explanations for the seeming anomaly. First the average wholesale prices used by SPIOER could be too high. Second, in some cases prices may have been reduced between 1967 and 1972. Third, different definitions of output and differences arising from the conflict between commodity versus establishment classifications also play a role.

Table 13

Estimated Sample Coverage of SPIOER Indexes in 1972

	Number of Sectors in Branch	Number of Sectors With a Sample	Minimum Sector Coverage (percent)	Maximum Sector Coverage (percent)	Branch Coverage [a] (percent)
Ferrous metals [b]	5	4	70.5	98.0	78.6
Nonferrous metals	2	1	37.8	37.8	29.1
Fuels [c]	6	6	23.4	86.6	71.8
Electric power	1	1	89.3	89.3	89.3
Machinery	27	21	8.3	100.0	67.4
Chemicals and petrochemicals	10	9	34.8	100.0	42.2
Wood, pulp, and paper	6	5	47.2	114.9	70.4
Construction materials	8	8	14.3	118.5	65.7
Light industry	8	7	16.2	159.1	56.4
Processed food	10	10	17.0	155.1	55.1
Total industry	83	72	8.3	159.1	59.9

[a] Branch coverage is the sum of the value of sector samples expressed as a percent of the branch GVO. In estimating SPIOER's coverage we have relied on two decision rules to compute shares. First, if the sector is represented within the SPIOER sample by an official GVO index, we assume that is equivalent to 100-percent coverage, since the official production indexes presumably are based on full coverage. See Abraham S. Becker, *Ruble Price Levels*. Second, if the sample coverage computes to more than the sector GVO, we assumed sector coverage is 100 percent for estimating branch and industry coverage.
[b] The coke products sectors of the ferrous metals branch is described by a proxy linked to the index for extraction of coking coal. In this tabulation the sample share for this sector is treated as zero. If the share were treated as complete coverage, branch coverage would increase from 78.6 percent to 88.6 percent.
[c] Two sector samples in the fuels branch—those for peat and oil shale—use an average unit value rather than a true unit price. In this tabulation the sample share is taken as zero, an obvious understatement. If the share were treated as 100 percent, the fuels branch sample share would only increase from 71.8 percent to 74.0 percent.

industry (ferrous and nonferrous metallurgy are combined). These GVOs are then "deflated" to constant 1972 rubles by the published Soviet indexes of enterprise wholesale prices. We realize that these indexes are not an adequate gauge of price movements. Nonetheless, analysis of their construction suggests they are most deficient in the machinery branch and less so elsewhere. Then revised branch indexes are constructed from the SPIOER data by using gross output weights in 1972 for the sectors, rather than value-added weights, to build synthetic branch GVO indexes in constant prices. Next, average annual rates of growth for the periods 1960-66 and 1967-72 are computed for both the deflated GVO branch indexes from the input-output table and the SPIOER indexes adjusted to a gross output basis.

Table 14

Percent

SPIOER and I-O GVO: Comparisons of Average Annual Growth Rates

	1960-66		1967-72	
	Deflated I-O Values	Revised SPIOER	Deflated I-O Values	Revised SPIOER
Metallurgy	7.4	7.5	5.2	5.1
Fuels	4.2	5.9	7.2	4.8
Electric power	11.6	10.7	8.5	7.9
Machinery	17.0	7.0	10.5	7.4
Chemicals and petrochemicals	12.0	10.9	11.2	8.0
Wood, pulp, and paper	3.8	2.3	5.8	3.3
Construction materials	7.7	7.3	6.8	5.7
Light industry	5.9	3.6	7.2	5.2
Processed food	5.4	5.4	5.7	5.2

In 15 of the 18 comparisons in table 14, the SPIOER growth rate is less than the growth of deflated GVO from the input-output tables; in one case the rates are equal and in only two instances are SPIOER rates greater.

The lower SPIOER rate is consistent with our understanding of Soviet price indexes. Because official price indexes do not capture all of the real price inflation, deflation of GVOs in the input-output tables by the official price series does not remove all of the price inflation from measured real growth. We would therefore expect SPIOER growth rates to be below those derived from input-output GVOs, as they generally are. While this does not prove that the sample is representative of all industrial output, it does suggest that any sampling errors are likely to produce a lower growth rate rather than a higher one. This is comforting because the greatest threats to measurement errors are likely in the opposite direction. (See the following discussion in "Biases in the Quantity and Value Data.")

Biases in the Basic Data

Changes in the Material Intensity of Production. Only the 1972 input-output table is used in the SPIOER computations to estimate the output indexes for the branches of industry. This practice implicitly assumes that the ratio of value added to gross output for each sector remains approximately constant over the period. If this assumption is wildly unrealistic, the SPIOER indexes would fail to move in a manner representative of the movement of national industrial output. To avoid this strong assumption, one would need a highly disaggregated input-output table for every year, although only three—for 1959, 1966, and 1972—have been compiled thus far. Even these three tables cannot be easily used together because SPIOER is a constant price index and the input-output tables are in current rubles.

Fortunately this work already has been partly done on a limited basis for 18 sectors in two companion studies by Vladimir Treml and Gene Guill.[32] By using these constant price tables for the three benchmark years—1959, 1966, and 1972—it becomes possible to compare movements in gross output and value added. The

[32] See Vladimir G. Treml, *Price Indexes for Soviet 18-Sector Input-Output Tables for 1959-1975*, Technical Note SSC-TN-5943-1, (Arlington, Virginia: SRI International, June 1978), for a derivation of the price indexes. Also see Gene D. Guill, *Deflation of the 18 Sector Soviet Input-Output Tables*, Technical Note SSC-TN-5943-4, (Arlington, Virginia: SRI International, August 1978), for the derivation of input-output tables for several years in 1970 producer prices.

Table 15

Gross Output and Value Added in Input-Output Tables at Constant Prices (Average Annual Percentage Rate of Growth)

Sector	1960-66			1967-72		
	Gross Output (percent)	Value Added [a] (percent)	Difference (percentage point)	Gross Output (percent)	Value Added [a] (percent)	Difference (percentage point)
Metallurgy	7.4	8.3	−0.9	5.7	3.3	2.4
Coal	0.8	−1.4	2.2	2.0	−1.0	3.0
Oil	8.6	9.8	−1.2	12.7	13.1	−0.4
Gas	17.8	17.8	0	5.6	4.9	0.7
Electric power	11.6	14.0	−2.4	8.3	9.1	−0.8
Machinery	13.1	12.0	1.1	10.2	12.3	−2.1
Chemicals and petrochemicals	11.8	12.5	−0.7	9.4	9.6	−0.2
Wood products	3.8	3.2	0.6	5.3	5.0	0.3
Paper	4.3	5.2	−0.9	11.7	10.9	0.8
Construction materials	7.7	9.2	−1.5	7.8	7.8	0
Light industry	5.7	6.0	−0.3	7.1	8.1	−1.0
Processed food [b]	4.8	NMF	NMF	5.2	NMF	NMF
Industry without processed food	7.8	7.3	0.5	8.2	8.5	−0.3

NMF means no meaningful figure.

[a] Including amortization deductions.
[b] A comparison for processed food is not possible because of the negative value added in this sector owing to heavy state subsidies.

results of this comparison (table 15) suggest that gross output does change, for the most part, in line with value added. In over two-thirds of the comparisons the differences in growth rates between gross output and value added are less than 1 percentage point. The cases with the largest divergence in growth rates are coal in both periods, electric power in 1960-66, and metallurgy and machinery in 1967-72. In general, value added tended to grow slightly slower than gross output in the early period and faster in the later period.

These results indicate that the assumption of a constant ratio of value added to gross output should not bias the SPIOER indexes much as measures of value added. Moreover, in those instances of wide disagreement between the gross output and value-added growth in table 15, the explanation may lie in the unreliability of the price deflators used for machinery output (and input) and changes in product mix within input-output sectors. If subsectors within any of the 18 sectors have widely disparate gross output to value-added ratios, the growth of gross output for the full sector need not match that of value added. SPIOER partially circumvents the product mix problem by disaggregating industrial production to a more detailed level than represented in the 18-sector input-output tables used by Treml and Guill. The greater level of detail in SPIOER allows variations in the ratio of value added to gross output at the 18-sector level and freezes the ratio only at a more detailed sectoral breakdown.

On balance, the effect on the SPIOER indexes of the inability to construct true indexes of value added—a problem that exists in the production indexes of many

Western countries—remains unresolved. Much depends on the direction and degree of technological change. If materials use or intensity has generally declined over time, SPIOER's growth would be excessively slow. Increases in materials intensity would cause errors in the opposite direction.

Biases in the Quantity and Value Data. While the SPIOER sample covers a large portion of Soviet industrial production in 1972, other sample properties could bias the synthetic indexes.

The *quantity series* employed in samples of sector production on balance may understate growth. For example, a bulldozer in a given model category produced in 1950 is counted the same as a bulldozer produced in, for example, 1962 despite any model improvements that may have been introduced. Ideally, the SPIOER methodology should account for changes in average product quality, but this would require engineering studies of every product. Quantity series also do not measure changes in product mix, which could reduce the reliability of these series as measures of production. Returning to the earlier example, the capacity of the average bulldozer has fluctuated over time as the product mix has changed. As a result, the fixed price weight used for the sample becomes unrepresentative. If the Soviet Union is gradually moving toward higher capacity equipment, the sample price becomes lower than the true average in later years, higher in earlier years, and growth is understated. Similar biases could occur in other sectors as well.

The magnitude of this quantity series bias depends on the nature of the product involved. Products that are less complex, more homogeneous, and less vulnerable to innovation, such as many industrial materials and basic consumer goods, probably are less vulnerable to this bias. Bias should be greatest in technically complex, heterogeneous products such as machinery.

Some notion of the possible extent of the bias that might arise in the machinery branch from using fixed price weights can be obtained by drawing on a recent CIA study.[33] This study has collected for several types of machinery produced during 1960-73 a sample of model numbers, prices, and physical specifications. The purpose of this study was to determine what price changes have occurred that cannot be explained by changes in product quality or mix.[34] A result of this research was the derivation of price indexes for two types of machinery represented by quantity series in SPIOER—construction machinery and hoist-transport equipment (cranes). By using these price series to deflate the final demand component for these two sectors in the 1959, 1966, and 1972 input-output tables to 1972 producer prices, we derive series similar conceptually to two quantity indexes in SPIOER, except that average unit prices are allowed to vary due to changes in product mix. Comparison of the growth rates of the series over the periods covered by the input-output table should give a rough indication in at least two quantity series of the scale of the bias that results from using fixed price weights.

The results of this test shown in table 16 suggest that the SPIOER quantity series do tend to understate growth. Although the fixed price series grow more rapidly in the 1960-66 period than the variable price series, the downward bias becomes evident when examining 1967-72 and both periods combined. Overall, the series with fixed price weights grow 1.1 and 0.4 percent less rapidly than the series with variable price weights for hoist-transport machinery and construction machinery, respectively.

We have attempted to limit the effect of this bias on the machinery index by disaggregating the product sample as much as possible. Trucks, cars, and buses are disaggregated by model numbers, for example. By increasing the level of product detail in this way, the sample implicitly adjusts for changes in product assortment and partly for quality improvements. This approach cannot be followed for most sectors, however, because the necessary production and price data are not available.

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[33] CIA, *An Analysis of the Behavior of Soviet Machinery Prices, 1960-73*, ER 79-10631, December 1979.

[34] The cited study estimates regressions for each type of machinery covered. By regressing prices on physical parameters and time, it is possible to discover how prices have increased because of changes in product specifications and inflation.

Table 16 Average Annual Percent

Comparison of Growth of Output in Two Sectors Using Fixed and Variable Price Weights

	1960-66	1967-72	1960-72
Hoist transport machinery			
Variable price weights [a]	8.4	9.5	8.9
Fixed price weights [b]	8.7	6.9	7.8
Construction machinery			
Variable price weights [a]	8.9	8.8	8.8
Fixed price weights [b]	10.3	6.2	8.4

[a] These series are derived from the deflated final demand of the respective sector from the input-output tables of 1959, 1966, and 1972. Because the CIA study has no price samples for 1966, the 1966 table in 1970 prices is used and then deflated to 1972 prices with the derived indexes.

Deliveries to final demand in current prices are found in the following sources:
1959—Dimitri M. Gallik, Barry L. Kostinsky, and Vladimir G. Treml, *Conversion of Soviet Input-Output Tables to Producers' Prices: The 1959 Reconstructed Table*, FER-No. 6 (Washington, D.C.: US Department of Commerce, February 1975).
1966—Treml and Guill, in Treml, *Studies*, pp. 197-281.
1972—Gallik, Guill, Kostinsky, and Treml, "The 1972 Input-Output Table," pp. 423-471.
Prices: The price deflators are taken from CIA, *An Analysis of the Behavior of Soviet Machinery Prices, 1960-73.*
[b] These series are derived from the SPIOER quantity series for these two sectors.

Much more has been written about the distortions afflicting both types of *value series*—official ruble value series and GVO index series—the double-counting and disguised price inflation alluded to earlier. The effect of changes in double-counting is relatively easy to understand; the inflationary bias perhaps requires more discussion.

Enterprise managers find it advantageous to boost prices to meet their performance targets. But it is difficult for managers to raise prices on standardized products since prices are controlled by the government. An exception is made, however, if the item can be considered a new product.[35] Then an enterprise can charge a new-product price, which is deliberately set higher than the price of the old product to recapture research and development costs of the new product. Later the temporary new-product price gives way for a permanent price. Because innovation is risky given the incentives confronting the Soviet manager, specifications of old products often change only slightly. This is enough, however, to allow him to charge a substantially higher price for this "new" product and to lead him to halt production of the older and cheaper model. Purchasers have little choice but to accept the more expensive item. As a consequence, value of production has increased more than could be justified by the degree of product change.

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[35] The new-product pricing phenomenon has been widely discussed in the literature. In particular see Abraham S. Becker, *Ruble Price Levels*; Joseph S. Berliner, *The Innovation Decision in Soviet Industry*; Padma Desai, "On Reconstructing Price, Output and Value-Added Indexes in Postwar Soviet Industry and Its Branches," pp. 55-77; Gregory Grossman, "Price Control, Incentives and Innovation in the Soviet Economy," Alan Abouchar, ed., *The Socialist Price Mechanism* (Durham, N. C.: Duke University Press, 1977); and CIA, *An Analysis of the Behavior of Soviet Machinery Prices, 1960-73.*

An inflationary bias is also introduced into the value series by the way constant or, in Soviet terminology, comparable prices *(sopostavimye tseni)* are set. For items in production before the base year for the comparable prices, the prices in effect in the base year are used in the series. For products introduced subsequently, the first permanent price is the comparable price. The output series therefore reflects a mixture of constant and current prices; the presence of price inflation will then bias the output index upward.

New-product pricing represents the serious measurement problem in industries where products are heterogeneous, where value measures would provide the only meaningful measure of output, and where many opportunities for innovation exist and product complexity makes it difficult to distinguish between real and cosmetic improvements. Although these features exist to some degree in all industrial branches, they are most characteristic of machinery and chemicals.

The study already referred to (*An Analysis of the Behavior of Soviet Machinery Prices, 1960-73*), can be used to gain some notion of the possible impact of disguised inflation on the value series. One type of machinery analyzed in that study is machine tools, for which SPIOER relies on the official value series in the *Narkhoz*. According to the value series, machine tool output in 1970 was 2.33 times the 1960 level—an average annual increase of 8.8 percent. The machinery price study concludes, however, that machine tool prices in 1970 were 28.7 percent above the 1960 level after allowance for changes in product characteristics. Deflating the value series by this price increase suggests that output in 1970 was only 181 percent above 1960 or that machine tool output increased at an average rate of only 6.1 percent per year, 2.7 percentage points per year less than the value series used by SPIOER. If the wholesale price index derived in that paper based on a sample of several types of machinery is representative of all of the value series incorporated in SPIOER, the hidden price changes incorporated in the value series and hence wrongly counted as real growth, would be significant:

Implied Price Inflation in Machinery	Average Annual Percent
1961-66	2.7
1967-70	5.7
1971-73	−1.6

This would suggest that in the 1960s the value series are upward biased and that at least in the early 1970s the value series are downward biased. Over the entire 13-year period, the implicit rate of inflation in the value series would average 2.6 percent per year.

Not all value series are subject to a large upward bias arising from price inflation. In some of the rapidly developing industries like precision instruments and electronics, prices have been reduced repeatedly to prevent the excessive accumulation of profits. Because those industries are in a relatively early phase of development, expansion of output generates substantial economies of scale and cost savings. In such cases the amount of disguised inflation would be much smaller than in more developed branches that are also represented by value series.

The relative importance of this kind of sample bias in the branch indexes can be determined from the composition of the sample in each branch. Six of the branch indexes are completely based upon quantity series. Distortions in the value series reported by the CSA could carry over to the synthetic indexes for the wood, pulp, and paper industry, light industry, chemicals, and machinery. The tabulation below indicates that machinery is the branch most affected by the value series. The value series are used to measure changes in only about one-fifth of industrial production.

Because quantity series and value series are not evenly distributed among the branches, indexes dominated by value series suffer most from the distortion caused by disguised inflation.

Shares in 1970 of Value Added Percent

Branch	Quantity Series	Value Series
Chemicals and petrochemicals	95	5
Wood, pulp, and paper	85	15
Light industry	65	35
Machinery		
Producer durables	41	59
Consumer durables	27	73

The Importance of Disguised Inflation. Considerable attention has been devoted to the possibility of hidden inflation in the value series included in the SPIOER samples. The major industrial branches in which value series are used to measure production are listed in table 17. The branch samples are divided into quantity or official value series, and two separate indexes are calculated for each branch—one for products reported in physical units and one for products reported by value. (Value-added weights are used to aggregate individual series.) The table compares the growth rates for these components of the branch indexes in which value series are important.

The value series generally grow substantially faster than the physical series. This does not necessarily mean that the differences are caused by disguised inflation of the value series. For example, in the wood, pulp, and paper industry the rapidly growing value series is furniture. While new-product pricing undoubtedly is a problem in the furniture industry, furniture output has been a stellar performer in a branch that otherwise is nearly stagnant. Similarly, it is not surprising that sewn goods—measured in rubles—is one of the fastest growing components of light industry; in later phases of development the processing of fabrics becomes more important than the manufacture of the fabrics themselves.

The results for consumer durables are surprising. Value series comprise a larger share of the sample than in any other part of SPIOER; ironically, the value series increase more rapidly than the quantity series only in three of the six periods. During the entire 29-year period, the value series increased only 0.9 percentage points per year faster. The producer durables comparison is more troublesome. Between 1950 and 1979 the value series in the producer durables sample increased on average nearly 4 percentage points faster than the quantity subsample—suggesting a substantial upward bias in the official value series.

Not all of the discrepancy in the machinery series can be attributed to index distortions, however. The quantity series do include machinery sectors that are actually growing more slowly than sectors represented by value series. For example, transport machinery—a quantity series—traditionally grows slowly once a nation's transportation infrastructure is in place, and instruments and computers—a value series—has been a fast growing sector since 1960. We can test this hypothesis in a rough way. The Soviets publish GVO indexes for subgroups of machinery at a level of detail that is unavailable in most of the other industrial branches. The official GVO machinery branch indexes for the years 1960, 1965, 1970, 1975, and 1980 were used to estimate subsample growth based strictly on official GVO data. These component indexes were then classified according to whether they were predominantly represented by quantity or value series in the SPIOER machinery sample. According to the rates of growth shown in table 18, the branch subsample represented by quantity series is growing about 2 percentage points less rapidly than the subsample described by value series. We conclude, therefore, that the machinery represented by quantity data are less dynamic machinery sectors.

Table 17

Average Annual Percent

Comparison of Growth of Quantity and Value Series Within Branches of Industry

	1951-55	1956-60	1961-65	1966-70	1971-75	1976-79
Wood, pulp, and paper						
Quantity series	7.0	5.0	1.8	1.9	1.3	−2.6
Official value series	18.1	17.8	10.4	9.1	8.8	4.3
Chemicals and petrochemicals						
Quantity series	11.4	10.2	11.8	8.9	8.4	3.3
Official value series	20.8	19.4	16.1	9.7	11.7	6.0
Light industry						
Quantity series	9.3	5.9	3.2	4.9	2.3	1.7
Official value series	13.4	7.6	1.2	12.2	3.5	4.5
Consumer durables						
Quantity series	17.7	11.5	9.4	7.6	14.8	2.1
Official value series	17.7	9.9	9.7	12.9	10.5	8.4
Producer durables						
Quantity series	10.8	12.2	6.8	5.5	5.1	2.2
Official value series	12.9	12.5	10.9	10.0	11.0	8.4

Whatever the reason, a wide disparity in growth rates clearly exists between the two types of subsamples in the producer durables index. How the underlying biases might affect the overall machinery index and the industrial index can only be judged by some fairly arbitrary sensitivity testing (table 19).

Six different assumptions regarding the bias in the producer durables sample are tested. In each case, we assume that the SPIOER growth rates are biased for specific reasons and reestimate growth taking into account the assumed adjustments. The cases tested allow for the downward biases of the quantity series, the upward biases of the value series, and combinations of both. The alternative assumptions are:

1. Real growth of the value series is the same as that of the quantity sample.
2. Real growth of the value series is 2 percentage points higher than that of the quantity series.
3. Real growth of the quantity series is 1 percentage point higher than the measured rate and equals the real growth of the value series.
4. Inflation in the value series is 3 percent per year.
5. The downward bias in the quantity series is 1 percentage point per year, and the upward bias in value series is 3 percentage points per year.
6. The downward bias in the quantity series is 1 percentage point per year, and real growth in the value series is 2 percentage points per year higher than the adjusted growth in the quantity series.

The impact of possible biases in the producer durables sample weakens considerably at higher levels of aggregation. The largest discrepancy between SPIOER growth and growth of hybrid indexes (1951-79) is 2.2 percentage points for producer durables, 1.2 percentage points for machinery, and just 0.3 percentage point for total industry. Moreover, in this case machinery growth is unrealistically low compared with that in other industrial sectors. Assumptions that give a more realistic machinery growth suggest that the error introduced into SPIOER indexes by any bias in the machinery index is no larger than half that in the worst case.

Table 18

Average Annual Percent

Growth of Machinery Samples Estimated From Official GVO Data

	1961-65	1966-70	1971-75	1976-80
Quantity series subsample [a]	11.3	9.1	8.3	5.0
Electrotechnical industry	10.1	8.4	6.7	5.6
Energy machinebuilding	13.7	9.7	8.4	4.5
Metallurgical, mining, and other machinery	9.5	6.8	7.1	3.2
Hoist transport machinery	15.1	8.4	7.4	4.1
Construction machinery	13.1	11.3	9.0	4.4
Railroad machinery	8.7	7.3	6.0	4.1
Automotive machinery	11.1	12.5	13.0	7.7
Value series subsample [a]	11.4	11.4	10.8	7.8
Machine tools	12.9	9.7	10.0	8.1
Instruments	16.2	17.8	18.5	14.0
Chemical machinery	16.1	10.3	9.2	6.8
Logging, pulp, and paper machinery	11.6	15.2	10.8	7.3
Light industry and food machinery	10.2	8.6	8.9	5.1
Metallic items	8.2	11.6	8.9	5.0
Metallic structurals	7.6	10.7	9.9	5.5
Machinery repair	11.4	9.3	8.7	6.1
Mixed quantity and value subsample				
Tractors and Agricultural machinery	13.3	8.[illegible]	11.2	6.1

[a] Because of difficulties in deriving weights, a simple average of the indexes is used to aggregate the subbranch elements. The average annual rates of growth are computed from the average indexes.

Table 19

Average Annual Percent

Growth of Soviet Industry Under Different Assumptions of Bias in the SPIOER Producer Durables Sample

	SPIOER	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Producer durables							
1951-55	11.8	10.8	11.8	11.8	10.3	10.6	13.1
1956-60	12.4	12.2	13.3	13.2	10.7	11.0	14.3
1961-65	8.9	6.8	7.9	7.8	7.4	7.9	9.0
1966-70	7.8	5.5	6.6	6.5	6.3	6.8	7.7
1971-75	8.6	5.1	6.3	6.1	6.8	7.2	7.4
1976-79	6.3	2.2	3.4	3.2	3.3	4.6	4.4
1951-79	9.4	7.2	8.3	8.2	7.7	8.1	9.4
Total machinery							
1951-55	9.6	9.4	9.7	9.7	9.1	9.2	10.1
1956-60	7.9	8.3	8.6	8.6	7.3	7.4	8.8
1961-65	7.4	6.2	6.8	6.8	6.6	6.8	7.5
1966-70	6.9	5.4	6.2	6.1	6.0	6.3	6.9
1971-75	7.9	5.6	6.1	6.2	6.7	7.0	7.1
1976-79	5.6	2.8	3.6	3.5	4.1	4.4	4.3
1951-79	7.6	6.4	7.0	6.9	6.7	6.9	7.5
Total industry							
1951-55	10.2	10.1	10.3	10.3	10.0	10.1	10.4
1956-60	8.3	8.9	8.8	8.8	8.3	8.3	10.5
1961-65	6.6	6.6	6.9	6.8	6.8	6.9	5.5
1966-70	6.3	5.9	6.1	6.1	6.0	6.1	6.3
1971-75	5.9	5.7	6.0	6.0	6.1	6.2	6.3
1976-79	3.6	2.8	3.1	3.1	3.4	3.5	3.4
1951-79	6.9	6.7	7.0	6.9	6.9	6.9	7.2

Appendix A

Table A-1

The SPIOER Sample: Products, Units, and Key Sources

Ferrous metals branch		
Ferrous ores sector		
Manganese ore	Tons	Narkhoz
Iron ore	Tons	Narkhoz
Ferrous metals sector		
Cast iron	Tons	Narkhoz
Rails and rail accessories	Tons	Narkhoz
Wire rod	Tons	Narkhoz
Plain wire	Tons	Narkhoz
Seamless pipe and tube	Tons	Narkhoz
Welded pipe and tube	Tons	Narkhoz
Heavy section pipe and tube	Tons	Narkhoz
Light section pipe and tube	Tons	Narkhoz
Steel plate	Tons	Narkhoz
Hot rolled sheet	Tons	Narkhoz
Cold rolled sheet	Tons	Narkhoz
Electrical sheet	Tons	Narkhoz
Tinplate	Tons	Narkhoz
Galvanized sheet	Tons	Narkhoz
Products for reprocessing	Tons	Narkhoz
Coke products sector		
Coke products (coking coal used as proxy)	Tons	Narkhoz
Refractory materials sector		
Fire clay	Tons	Narkhoz, Estimate
Dinas	Tons	Narkhoz, Estimate
Magnesite and chrome magnesite items	Tons	Narkhoz, Estimate
Magnesite powder/metallurgical	Tons	Narkhoz, Estimate
Nonferrous metals branch		
Nonferrous metals sector		
Copper	Tons	Estimate
Lead	Tons	Estimate
Zinc	Tons	Estimate
Tin	Tons	Estimate
Aluminum	Tons	Estimate
Magnesium	Tons	Estimate
Titanium	Tons	Estimate
Nickel	Tons	Estimate
Antimony	Tons	Estimate

Table A-1 (continued)

The SPIOER Sample:
Products, Units, and Key Sources

Mercury	Ton	Estimate
Cadmium	Tons	Estimate
Tungsten (60%wo3)	Tons	Estimate
Molybdenum	Tons	Estimate
Fuels branch		
Coal sector		
Coking coal	Tons	Narkhoz
Lignite	Tons	Narkhoz
Noncoking hard coal	Tons	Narkhoz
Oil extraction sector		
Oil (including gas condensate)	Tons	Narkhoz
Oil refining sector		
Refined products	Tons	Estimate
Gas sector		
Natural gas from wells	Cubic meter	Narkhoz, Journals, Estimate
Asociated natural gas	Cubic meter	Narkhoz, Journals, Estimate
Peat sector		
Peat	Tons of standard fuel	Narkhoz
Oil shales sector		
Oil shale	Tons of standard fuel	Narkhoz
Electric power branch		
Electric power sector		
Electric power distributed from busbars	Kilowatt-hours	Narkhoz
Machinery branch		
Energy and power machinery sector		
Steam boilers (high capacity)	Tons/hours	Narkhoz, Estimate
Steam boilers (medium capacity)	Tons/hours	Narkhoz, Estimate
Steam boilers (low capacity)	Tons/hours	Estimate
Steam and gas turbines	Kilowatt	Narkhoz, Estimate
Hydraulic turbines	Kilowatt	Narkhoz, Estimate
Electrotechnical machinery and equipment sector		
Generators (steam and gas turbines)	Kilowatt	Narkhoz, Estimate
Generators hydraulic turbines	Kilowatt	Narkhoz, Estimate
Electric motors over 100 kilowatt	Kilowatt	Narkhoz
Power transformers	Kilowatt-amps	
Electric bulbs	Units	Narkhoz
Machine tools sector		
Metal cutting machine tools	Rubles	Narkhoz
Forge presses sector		
Forge press machine tools	Rubles	Narkhoz

Table A-1 (continued)

Precision instruments sector		
Instruments of time	Rubles	Narkhoz
Other instruments and computers	Rubles	Narkhoz
Metallurgical and mining machinery and equipment sector		
Metallurgy machinery and equipment except rolling mills	Tons	Narkhoz
Rolling mill equipment	Tons	Narkhoz
Coal combines	Units	Narkhoz
Coal cutting machines	Units	Narkhoz
Mine loading machines	Units	Narkhoz
Electric mine locomotives	Units	Narkhoz
Petroleum equipment/refinery	Tons	Narkhoz, Estimate
Deep-well pumps	Units	Narkhoz
Turbodrills	Units	Narkhoz
Pumps and compressors sector		
Refrigerators	Units	Narkhoz
Chemical equipment	Rubles	Narkhoz
Log and paper machinery and equipment sector		
Log and paper machinery and equipment	Index	Narkhoz
Light-industry machinery and equipment sector		
Light-industry machinery and equipment	Rubles	Narkhoz
Food-industry machinery and equipment sector		
Food-industry machinery and equipment	Rubles	Narkhoz
Printing machinery and equipment sector		
Printing-industry machinery and equipment	Rubles	Narkhoz
Hoist-transport equipment sector		
Railroad cranes	Units	Narkhoz
Truck cranes	Units	Narkhoz
Tower cranes	Units	Narkhoz
Pneumatic tire cranes	Units	Narkhoz
Electric bridge cranes	Units	Narkhoz
Elevators	Units	Narkhoz
Construction machinery and equipment sector		
Excavators/multibucket	Units	Narkhoz, Estimate
0.15- to 0.20-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
0.25- to 0.30-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
0.35- to 0.80-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
1- to 1.25-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
1.4- to 2.5-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
3- to 8-cubic-meter single-bucket excavators	Units	Narkhoz, Estimate
10 and more single-bucket excavators	Units	Narkhoz, Estimate
Bulldozers	Units	Narkhoz
Scrapers	Units	Narkhoz
Motor graders	Units	Narkhoz

Table A-1 (continued)

The SPIOER Sample: Products, Units, and Key Sources

Transportation, machinery and equipment sector		
Reefers, mainline freight	Units	Estimate
Box cars, mainline freight	Units	Estimate
Flat cars, mainline freight	Units	Estimate
Gondola cars, mainline freight	Units	Estimate
Tank cars, mainline freight	Units	Narkhoz
Cement cars, mainline freight	Units	Estimate
TE-1 diesel locomotives	Units	Estimate
TE-2 diesel locomotives	Units	Estimate
TE-3, -7, -10, -30 electric diesel	Units	Estimate
TE-4 diesel locomotives	Units	Estimate
TE-50,TEP-60, IE-40 electric diesel	Units	Estimate
TGP-50,TG-102, I E-106 diesel hydraulic	Units	Estimate
G-1 /GT-101/ gas turbines	Units	Estimate
VL-22m, direct current	Units	Estimate
VL-8, -10, T-8 direct current	Units	Estimate
VL-23 electric locomotives	Units	Estimate
N-O electric locomotives	Units	Estimate
N-8 electric locomotives	Units	Estimate
N-60 electric locomotives	Units	Estimate
VL alternating current	Units	Estimate
L steam locomotives	Units	Estimate
Sum steam locomotives	Units	Estimate
SO steam locomotives	Units	Estimate
LV steam locomotives	Units	Estimate
P 36 steam locomotives	Units	Estimate
Railroad passenger cars	Units	Narkhoz
Trolley cars	Units	Narkhoz
Subway cars	Units	Narkhoz
Civilian shipbuilding	Units	Estimate by type
Civilian aircraft	Units	Estimate by type
Automobiles sector		
Motorcycles	Units	Narkhoz, Estimate
Moped	Units	Narkhoz, Estimate
Bicycles	Units	Narkhoz, Estimate
Motor scooters	Units	Narkhoz, Estimate
Consumer autos	Units	Estimate
Consumer auto prices	Index	Estimate
Cars		
Moskvich-400 sedan	Units	
Moskvich cabriolet model	Units	Estimate
Moskvich station wagon	Units	Estimate
Moskvich 2136, 2138, 2140, IZH-2125	Units	Estimate

Table A-1 (continued)

Moskvich 423 and 424	Units	Estimate
Zil limousine	Units	Estimate
Zim sedan	Units	Estimate
Gaz-67 jeep	Units	Estimate
Uaz-469 jeeps	Units	Estimate
Pobeda	Units	Estimate
Gaz-21, 24/volga	Units	Estimate
Zaz-965, 966, 968, 968a	Units	Estimate
Gaz-13,14/chayka	Units	Estimate
Vaz-2103, 2102, 2106, NIVA-2121	Units	Estimate
Trucks		
Vaz-21011	Units	Estimate
Gaz-51	Units	Estimate
Gaz-63	Units	Estimate
Gaz-53f, 53a, 66, 52	Units	Estimate
Gaz-93	Units	Estimate
Zil-157,157k	Units	Estimate
Zil-164,164a	Units	Estimate
Zil-150	Units	Estimate
Zil-151	Units	Estimate
Zil-585	Units	Estimate
Ural zis-335, 355m, 356, 358, 375, 37	Units	Estimate
Zil-130, 131	Units	Estimate
Yaaz-200, 210, 214, 219, 221, 22	Units	Estimate
Kraz-214, 219, 221, 222, 255, 257	Units	Estimate
Maz-200, 205	Units	Estimate
Maz-500-504a, 509, 514, 516	Units	Estimate
Maz-525	Units	Estimate
Belaz-528, 529, 530, 531, 540, 548, 54	Units	Estimate
Moaz-542, 546, 522	Units	Estimate
Trucks (continued)		
Kaz-120	Units	Estimate
Kaz-585 and B, 585 and V	Units	Estimate
Kaz-602, 606, 608, 608B	Units	Estimate
Kaz-600 and A, 600B and V	Units	Estimate
Gaz-AA	Units	Estimate
Ural-Zil-5/353, 355M and 356	Units	Estimate
Moskvich-430, 432	Units	Estimate
Uaz-450, 451, 452	Units	Estimate
Kamaz-5320, 5410	Units	Estimate
Abz-50 and miscellaneous	Units	Estimate
Kaz-120	Units	Estimate
Kaz-585 and B, 585 and V	Units	Estimate

Table A-1 (continued)

The SPIOER Sample:
Products, Units, and Key Sources

Kaz-602, 606, 608, 608B	Units	Estimate
Kaz-600 and A, 600B and V	Units	Estimate
Gaz-AA	Units	Estimate
Ural-Zil-5/353, 355M and 356	Units	Estimate
Moskvich-430, 432	Units	Estimate
Uaz-450, 451, 452	Units	Estimate
Kamaz-5320, 5410	Units	Estimate
Abz-50 and miscellaneous	Units	Estimate
Buses		
Kavz-651, 685	Units	Estimate
Paz-651, 652, 652B, 672	Units	Estimate
Zil-115, 118, 127, 155, 158	Units	Estimate
Ta-6	Units	Estimate
Laz-695, 695E	Units	Estimate
Laz-698, 699, 699A, 697	Units	Estimate
Raf-251, 976, 977V, 977D	Units	Estimate
Liaz-677	Units	Estimate
Trolley buses	Units	Estimate
Automotive spare parts	Rubles	Estimate
Agricultural machinery and equipment sector		
Agricultural machinery	Rubles	Narkhoz
Tracklaying tractors	Units	Estimate by model
Wheeled tractors	Units	Estimate by model
Other machinery sector		
Tovari series	Rubles	Narkhoz
Household chemicals deduction	Index	Narkhoz
Furniture deduction	Rubles	Narkhoz
Sanitary engineering products sector		
Bath water heaters	Units	Narkhoz, Estimate
Enameled iron bathtubs	Units	Narkhoz, Estimate
Heating boilers	Units	Narkhoz, Estimate
Heating radiators	Units	Narkhoz, Estimate
Sewer pipe and fittings	Standard kilometer	Narkhoz, Estimate
Other metalwares sector		
Other metalwares	Index	Narkhoz
Metallic structurals sector		
Metal structurals	Index	Narkhoz
Machinery repair sector		
Machinery repair	Index	Narkhoz
Chemicals and petrochemicals branch		
Mineral chemicals sector		
Mineral chemicals	Index	Narkhoz
Basic chemicals sector		

Table A-1 (continued)

Nitrogen fertilizer	Tons	Narkhoz
Phosphorite fertilizer	Tons	Narkhoz
Phosphorous fertilizer	Tons	Narkhoz
Potassium fertilizer	Tons	Narkhoz
Sulfuric acid	Tons	Narkhoz
Soda ash (95 percent)	Tons	Narkhoz
Caustic soda	Tons	Narkhoz
Anilyne dye products sector		
Synthetic dyes	Tons	CMEA Handbook
Synthetic resins and plastics sector		
Plastics and resins	Tons	Narkhoz
Synthetic fibers sector		
Chemical fibers and knits	Tons	Narkhoz
Organic synthetic products sector		
Ethyl alcohol (nonfood based)	Gallon	Estimate
Synthetic ammonia	Tons	CMEA Handbook
Benzol	Tons	CMEA Handbook
Chlorine	Tons	Estimate
Phenol	Tons	CMEA Handbook
Paints and lacquers sector		
Dry zinc whites	Tons	Estimate
Enamels and primers	Tons	Estimate
Litharge and red lead	Tons	Estimate
Natural drying oil	Tons	Estimate
Nitrocellulose varnish and solvents	Tons	Estimate
Oil varnishes and siccatives	Tons	Estimate
Oksol drying oil	Tons	Estimate
Rubber products sector		
Motor vehicle tires	Units	Narkhoz
Synthetic rubber sector		
Synthetic rubber	Tons	Narkhoz
Wood, pulp, and paper products branch		
Logging sector		
Fuelwood	Cubic meter	Narkhoz
Industrial logs	Cubic meter	Narkhoz
Sawing and woodworking sector		
Plywood	Cubic meter	Narkhoz
Lumber	Cubic meter	Narkhoz
Furniture sector		
Furniture	rubles	Narkhoz
Pulp and paper sector		
Newsprint	Tons	Narkhoz, Estimate
Wrapping and packing	Tons	Narkhoz, Estimate

Table A-1 (continued)

The SPIOER Sample: Products, Units, and Key Sources

Printing	Tons	Narkhoz, Estimate
Writing paper	Tons	Narkhoz, Estimate
Sacking	Tons	Narkhoz, Estimate
Offset printing	Tons	Narkhoz, Estimate
Cover paper	Tons	Narkhoz, Estimate
Winding	Tons	Narkhoz, Estimate
Deep printing	Tons	Narkhoz, Estimate
Lithographic	Tons	Narkhoz, Estimate
Cartographic	Tons	Narkhoz, Estimate
Cable insulation	Tons	Narkhoz, Estimate
Capacitor	Tons	Narkhoz, Estimate
Waxing paper	Tons	Narkhoz, Estimate
Other paper products	Tons	Narkhoz, Estimate
Paperboard	Tons	Narkhoz, Estimate
Wood chemicals sector		
Oleoresin and rosin	Tons	Estimate
Construction materials branch		
Cement sector		
Portland cement—homogeneous	Tons	Journals, Narkhoz, Estimate
Portland cement—mix adjustment	Index	Journals, Narkhoz, Estimate
Slag portland cement	Tons	Journals, Narkhoz, Estimate
Slag cement—mix adjustment	Index	Journals, Narkhoz, Estimate
Pozzolana portland cement	Tons	Journals, Narkhoz, Estimate
Pozzolana cement—mix adjustment	Index	Journals, Narkhoz, Estimate
Decorative cement	Tons	Journals, Narkhoz, Estimate
Tamponage cement	Tons	Journals, Narkhoz, Estimate
Unallocated cement	Tons	Journals, Narkhoz, Estimate
Portland cement—Mark 200	Tons	Journals, Narkhoz, Estimate
Portland cement—Mark 300	Tons	Journals, Narkhoz, Estimate
Portland cement—Mark 400	Tons	Journals, Narkhoz, Estimate
Portland cement—Mark 500	Tons	Journals, Narkhoz, Estimate
Portland cement—Mark 600	Tons	Journals, Narkhoz, Estimate

Table A-1 (continued)

Marked, nonportland cement	Tons	Journals, Narkhoz, Estimate
Nonportland—mix adjustment	Tons	Journals, Narkhoz, Estimate
Unmarked cement	Tons	Journals, Narkhoz, Estimate
Concrete sector		
Precast concrete	Cubic meter	Estimate, Narkhoz
Prestressed concrete	Cubic meter	Narkhoz
Wall materials sector		
Roofing tile	Square meter	Narkhoz
Construction brick	Standard unit	Narkhoz
Dimension and fieldstone	Standard unit	Narkhoz
Concrete and silicate wall blocks	Standard unit	Narkhoz, Estimate
Other wall materials	Standard unit	Narkhoz, Estimate
Asbestos cement sector		
Asbestos cement shingle	Standard unit	Narkhoz
Asbestos cement pipe	Standard kilometer	Estimate, Republic Narkhoz
Roofing material sector		
Soft roofing	Square meter	Narkhoz
Construction ceramics sector		
Ceramic tiles-facing and floors	Square meter	Narkhoz, Estimate
Ceramic sewer pipe	Tons	Estimate, Journals
Other materials for construction sector		
Construction lime	Tons	Estimate, Republic Narkhoz
Gypsum	Tons	Estimate, Republic Narkhoz
Mineral wool insulation	Cubic meter	Journals, Estimate, Republic Narkhoz
Rock products	Cubic meter	Narkhoz
Glass and porcelain sector		
Window glass	Square meter	Narkhoz
Polished glass	Square meter	Journals, Estimate
Light-industry branch		
Cotton fabric sector		
Cotton cloth	Square meter	Narkhoz
Silk fabric sector		
Silk cloth	Square meter	Narkhoz
Wool fabric sector		
Wool cloth	Square meter	Narkhoz
Carpeting	Square meter	Narkhoz
Linen fabric sector		
Linen cloth	Square meter	Narkhoz
Hosiery and knitwear sector		
Knit outerwear	Pieces	Narkhoz

Table A-1 (continued)

The SPIOER Sample: Products, Units, and Key Sources

Knit underwear	Pieces	Narkhoz
Hosiery	Pairs	Narkhoz
Sewn goods sector		
Sewn goods	Rubles	Narkhoz
Other light-industry sector		
Leather footwear	Pairs	Narkhoz
Rubber footwear	Pairs	Narkhoz
Felt footwear	Pairs	Narkhoz
Processed food branch		
Fish products sector		
Canned fish	Standard Can	Narkhoz
Gross fish	Tons	Narkhoz
Meat products sector		
Mutton	Tons	Narkhoz
Pork	Tons	Narkhoz
Beef and veal	Tons	Narkhoz
Poultry	Tons	Narkhoz
Other meat	Tons	Narkhoz
Dairy products sector		
Canned milk	Standard Can	Narkhoz
Whole milk	Tons	Narkhoz
Butter	Tons	Narkhoz
Cheese	Tons	Narkhoz, Estimate
Sugar sector		
Refined sugar	Tons	Narkhoz
Net granular sugar	Tons	Narkhoz, Estimate

Table A-1 (continued)

Flour and cereal sector		
Macaroni products	Tons	Narkhoz
Flour	Tons	Narkhoz
Flour quality	Index	Estimate
Bread products sector		
Bread products	Tons	Estimate
Confectionary products sector		
Confectionary goods	Tons	Narkhoz
Vegetable oils sector		
Net vegetable oil	Tons	Narkhoz, Estimate
Margarine products	Tons	Narkhoz
Fruit and vegetable products sector		
Canned juice	Standard can	Narkhoz
Canned fruits	Standard can	Narkhoz
Canned meat	Standard can	Narkhoz
Canned vegetables	Standard can	Narkhoz
Canned tomatoes	Standard can	Narkhoz
Other canned goods	Standard can	Narkhoz
Other food sector		
Soap	Tons	Narkhoz
Champagne	Bottles	Estimate
Vodka and vodka products	Dekaliter	Estimate, Republic Handbooks
Beer	Dekaliter	Narkhoz
Cigarettes	100 item	CMEA Handbook
Wine	Dekaliter	Narkhoz, Estimate

Table A-2

Gross Sector Output Indexes: Ferrous and Nonferrous Metals

	Ferrous Metals				Nonferrous Metals
	Ferrous Ores	Ferrous Metals	Coke Products	Refractory	
1950	23.35	21.00	31.37	42.80	19.01
1951	26.93	23.84	33.10	46.23	21.54
1952	30.84	27.28	35.51	51.06	24.24
1953	34.42	29.90	37.71	55.17	27.03
1954	36.45	32.79	42.96	59.03	29.58
1955	40.09	36.22	47.17	63.13	34.72
1956	43.21	39.03	50.34	66.08	36.81
1957	46.38	41.24	53.12	68.92	38.88
1958	48.75	44.29	57.28	71.31	41.04
1959	51.34	48.71	61.16	76.54	44.38
1960	57.25	52.68	66.86	81.70	48.37
1961	62.73	57.42	68.22	85.65	52.42
1962	68.15	61.94	71.27	89.52	57.07
1963	72.80	65.75	77.10	91.19	61.53
1964	77.28	71.04	81.07	93.88	65.21
1965	81.47	76.05	84.32	95.98	69.88
1966	84.77	81.56	86.49	98.92	76.69
1967	87.51	87.03	89.57	100.12	83.50
1968	90.30	91.46	93.74	100.46	90.17
1969	94.57	94.48	97.85	99.42	94.66
1970	100.00	100.00	100.00	100.00	100.00
1971	103.42	104.09	102.67	100.66	107.02
1972	106.54	108.01	103.14	100.38	112.72
1973	110.83	112.59	105.24	102.58	119.56
1974	114.62	117.93	106.51	104.65	126.92
1975	119.56	123.39	109.85	106.64	132.89
1976	122.74	126.73	112.99	108.05	137.08
1977	123.03	127.93	113.07	107.28	141.26
1978	125.74	131.30	110.43	105.69	145.90
1979	125.63	131.35	110.92	106.33	150.22

Table A-2 (continued)

Gross Sector Output Indexes: Fuels and Electric Power

	Fuels						Electric Power
	Coal	Oil Extraction	Oil Refining	Gas	Peat	Oil Shales	
1950	39.47	10.73	13.32	2.91	83.62	14.77	12.48
1951	42.75	11.97	14.91	3.16	92.09	18.18	14.20
1952	45.55	13.40	16.69	3.23	86.44	20.45	16.25
1953	48.08	14.95	18.68	3.47	89.27	23.86	18.33
1954	52.37	16.79	21.09	3.79	104.52	27.27	20.49
1955	58.97	20.05	23.55	4.54	117.51	37.50	23.10
1956	64.56	23.74	28.63	6.10	103.95	39.77	26.03
1957	69.57	27.86	32.95	9.39	127.12	42.05	28.51
1958	74.62	32.07	36.24	14.19	119.21	51.14	32.00
1959	76.88	36.70	40.68	17.88	129.94	52.27	35.97
1960	78.83	41.88	45.16	22.89	115.25	54.55	39.65
1961	78.91	47.04	49.41	29.80	110.17	59.09	44.46
1962	80.91	52.75	55.23	37.14	72.88	65.91	50.16
1963	83.38	58.37	60.79	45.38	122.60	73.86	55.80
1964	86.70	63.34	64.43	54.85	125.42	80.68	62.03
1965	90.52	68.80	68.83	64.50	96.05	84.09	68.26
1966	92.35	75.10	74.11	72.22	137.85	85.23	73.48
1967	94.49	81.60	80.89	79.54	126.55	85.23	79.13
1968	95.26	87.57	86.44	85.43	103.39	86.36	86.09
1969	97.74	93.01	92.11	91.50	94.35	90.91	92.90
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	102.54	106.81	106.78	107.30	96.61	104.55	108.12
1972	104.73	113.43	115.38	111.84	111.30	113.64	115.80
1973	106.87	121.53	124.11	119.38	108.47	117.05	123.62
1974	109.46	130.00	133.23	131.60	75.71	121.59	131.88
1975	112.31	139.02	141.16	146.14	104.52	122.73	140.58
1976	114.33	147.20	144.73	162.14	63.84	125.00	150.29
1977	115.77	154.60	152.66	174.80	79.10	129.55	155.65
1978	115.76	161.89	161.78	188.03	51.98	131.82	162.90
1979	115.32	165.87	168.52	205.41	76.84	134.09	167.68

Table A-2 (continued)

Gross Sector Output Indexes: Machinery

	Energy and Power Machinery	Electrotechnical Machinery and Equipment	Machine Tools	Forge Presses	Precision Instruments	Metallurgical and Mining Machinery and Equipment
1950	16.97	14.42	9.68	6.46	2.62	42.53
1951	20.57	17.43	11.56	8.62	3.34	44.58
1952	26.51	18.93	13.80	11.46	4.24	51.95
1953	35.04	20.96	16.48	15.24	5.38	59.12
1954	39.87	22.16	19.68	20.28	6.80	57.02
1955	46.71	25.32	23.52	27.40	8.71	57.22
1956	47.51	28.72	26.50	31.22	11.24	60.28
1957	44.76	32.64	29.87	35.57	14.50	62.75
1958	48.38	35.59	33.66	40.53	18.71	69.93
1959	52.33	41.74	37.94	46.18	22.28	76.72
1960	62.45	47.57	42.84	52.44	26.51	80.61
1961	72.90	53.81	49.80	57.32	30.75	78.34
1962	81.95	61.49	53.58	59.76	35.71	86.35
1963	82.46	67.24	56.95	71.14	40.35	85.21
1964	91.14	71.37	62.07	65.45	42.33	88.08
1965	97.45	76.73	65.24	65.45	46.14	89.24
1966	106.12	79.01	72.80	71.54	53.67	92.91
1967	106.64	86.09	80.78	78.86	61.56	99.71
1968	112.91	90.23	88.04	87.40	71.19	103.32
1969	104.93	94.73	93.35	94.31	83.59	101.60
1970	100.00	100.00	100.00	100.00	100.00	100.00
1971	99.63	110.96	107.67	110.98	114.35	103.53
1972	93.00	116.81	116.56	120.73	135.76	104.59
1973	97.55	121.67	129.14	133.74	162.58	108.58
1974	107.81	123.99	141.82	150.81	195.84	109.62
1975	117.86	130.74	152.66	161.79	229.35	109.64
1976	115.35	131.53	164.34	184.84	261.79	119.35
1977	113.07	134.93	181.08	198.07	305.93	121.70
1978	113.44	136.84	197.48	216.43	355.52	121.93
1979	117.75	136.94	207.14	231.80	410.37	121.41

Table A-2 (continued)

Gross Sector Output Indexes: Machinery

	Pumps and Compressors	Log and Paper Machinery and Equipment	Light Industry Machinery and Equipment	Food Industry Machinery and Equipment	Printing Machinery and Equipment	Hoist Transport Equipment Equipment
1950	3.24	10.11	33.67	28.52	19.01	19.79
1951	4.44	11.25	34.65	29.51	19.17	24.53
1952	5.93	12.50	35.67	30.52	13.08	27.28
1953	8.01	13.90	36.91	31.77	13.19	33.60
1954	9.66	15.46	38.35	33.20	17.24	36.70
1955	11.63	17.19	40.21	35.09	22.24	39.28
1956	13.32	19.11	41.88	36.74	28.29	36.98
1957	16.34	21.25	43.70	38.58	32.96	43.50
1958	18.38	23.63	45.86	38.12	41.57	51.33
1959	27.16	26.70	48.56	42.48	48.53	42.46
1960	34.88	29.53	51.63	47.33	55.50	45.54
1961	38.99	31.42	55.16	49.92	58.00	51.76
1962	43.55	37.09	59.26	52.66	60.71	58.39
1963	47.28	40.16	63.35	55.55	59.13	62.58
1964	56.74	45.12	61.86	58.59	64.98	65.32
1965	66.50	51.03	65.35	64.83	70.04	70.95
1966	76.07	62.32	75.58	71.38	78.12	76.04
1967	81.98	71.95	87.44	81.10	83.73	82.19
1968	88.78	83.44	91.30	86.05	89.29	86.02
1969	95.40	92.28	95.35	95.35	96.63	90.74
1970	100.00	100.00	100.00	100.00	100.00	100.00
1971	112.21	113.20	106.51	102.91	102.18	108.31
1972	121.84	124.24	115.81	112.79	106.94	113.23
1973	134.13	136.09	130.23	122.09	109.52	118.16
1974	144.05	146.80	146.28	135.17	120.83	124.83
1975	155.97	161.59	160.70	145.64	120.44	126.50
1976	166.77	178.79	168.56	155.65	128.42	131.39
1977	174.47	193.85	181.29	165.02	136.62	132.82
1978	184.40	206.13	192.67	169.86	146.65	136.94
1979	188.76	220.16	200.53	175.03	156.69	139.27

Table A-2 (continued)

Gross Sector Output Indexes: Machinery

	Construction Machinery and Equipment	Transportation Machinery and Equipment	Automobiles	Agricultural Machinery and Equipment	Other Machinery	Sanitary Engineering Products	Other Metalwares	Metallic Structurals	Machinery Repair
1950	19.92	19.29	13.59	15.12	8.29	13.18	12.25	13.42	12.02
1951	21.02	13.96	13.45	15.07	7.84	16.46	13.89	15.13	13.45
1952	21.62	11.86	14.71	15.77	10.32	19.17	15.57	16.86	15.06
1953	23.62	18.26	17.63	17.12	13.77	21.52	17.44	18.77	16.87
1954	24.80	25.62	21.63	20.60	17.57	23.60	19.62	20.99	18.88
1955	25.67	31.45	24.94	26.40	23.67	25.92	22.51	23.94	21.14
1956	30.14	42.98	27.95	33.85	25.20	29.36	24.77	26.19	23.67
1957	35.70	67.47	31.77	42.99	26.12	33.85	27.13	28.52	26.51
1958	39.53	94.16	36.04	39.46	26.27	39.09	29.88	31.22	29.68
1959	40.75	102.36	40.06	34.81	28.87	46.22	34.06	35.27	33.53
1960	47.01	82.70	41.67	40.14	31.65	53.94	37.05	41.83	37.31
1961	54.75	67.09	44.97	49.28	35.40	60.60	41.13	43.92	41.25
1962	59.21	79.85	48.98	57.60	38.26	66.99	46.31	46.85	46.89
1963	62.81	74.71	52.57	66.77	41.39	73.70	50.39	50.62	52.23
1964	70.95	80.94	57.46	69.75	46.12	78.13	54.09	55.22	58.76
1965	75.40	90.04	59.56	74.03	49.42	83.19	57.80	60.24	64.10
1966	80.79	73.03	67.72	78.55	56.50	86.91	63.58	64.46	68.59
1967	87.53	76.48	73.12	81.48	65.45	90.30	71.68	72.29	75.00
1968	93.21	105.22	78.76	86.68	78.51	92.22	80.35	82.53	82.05
1969	101.82	102.84	82.21	94.79	90.24	95.67	89.60	89.16	90.38
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	109.56	114.78	115.83	108.88	112.52	104.60	110.00	109.00	110.00
1972	116.01	121.82	127.79	118.48	125.62	108.59	119.00	121.00	119.00
1973	121.18	130.33	141.88	133.57	139.99	113.74	131.00	135.00	129.00
1974	126.58	132.11	156.48	151.74	155.48	119.76	142.00	146.00	140.00
1975	134.08	138.17	164.99	163.69	169.70	124.37	153.00	160.00	152.00
1976	136.06	137.03	171.54	173.65	180.84	126.87	162.00	173.00	163.00
1977	137.40	137.47	178.71	181.90	196.31	129.34	171.00	183.00	174.00
1978	132.45	137.57	187.32	193.96	214.51	131.92	181.81	194.57	184.00
1979	132.69	141.50	194.09	203.13	227.54	137.80	188.69	201.93	192.00

Table A-2 (continued) Index: 1970 = 100

Gross Sector Output Indexes: Chemicals and Petrochemicals

	Mineral Chemicals	Basic Chemicals	Aniline Dye Products	Synthetic Resins and Plastics	Synthetic Fibers	Organic Synthetic Products	Paints and Lacquers	Rubber Products	Synthetic Rubber
1950	4.78	12.26	49.61	4.01	3.88	7.27	18.27	21.38	15.75
1951	5.75	13.35	56.08	3.95	5.68	8.30	21.78	21.72	18.82
1952	7.08	14.73	62.25	4.54	7.90	9.55	23.51	21.95	20.57
1953	8.62	16.29	63.14	5.57	10.00	11.57	24.55	23.44	23.19
1954	10.45	18.46	66.94	7.29	12.65	13.08	28.68	26.81	23.41
1955	12.31	21.29	77.87	9.58	17.74	15.22	30.54	29.43	26.26
1956	14.86	24.06	81.68	11.22	20.69	18.07	33.56	32.74	26.91
1957	16.91	25.61	80.29	12.25	23.87	21.03	38.78	36.93	25.93
1958	20.18	27.05	84.64	14.17	26.65	27.46	42.34	41.58	32.82
1959	23.99	28.36	86.53	16.24	28.81	32.24	49.41	44.71	33.92
1960	29.84	30.19	88.74	18.63	33.90	35.54	53.85	49.75	37.96
1961	35.17	33.39	90.31	22.94	40.19	38.16	52.80	54.87	42.01
1962	39.64	37.04	90.32	27.01	44.51	42.33	56.66	60.21	49.78
1963	42.33	42.46	91.94	33.91	49.50	48.80	57.97	65.17	51.09
1964	51.27	50.58	90.87	41.90	57.96	56.65	60.07	70.37	56.24
1965	62.89	59.85	87.09	48.00	65.38	69.28	68.25	76.35	66.08
1966	70.44	67.33	93.69	58.06	73.56	73.63	75.77	79.88	72.65
1967	76.73	74.43	92.84	66.56	81.96	81.85	85.77	85.60	79.87
1968	81.76	80.31	92.62	77.20	88.88	85.99	87.71	91.78	83.92
1969	88.05	85.50	98.05	86.85	93.66	91.72	91.82	94.30	91.47
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	110.69	109.19	100.63	111.44	108.57	106.67	109.96	104.56	109.41
1972	120.13	116.62	94.57	122.07	119.76	112.03	112.65	112.07	115.97
1973	136.48	127.39	91.99	138.72	133.23	119.52	116.37	122.18	126.37
1974	153.46	141.03	91.92	149.05	142.38	126.33	127.40	136.05	141.14
1975	174.00	156.51	93.49	169.92	153.29	133.38	133.47	148.70	158.64
1976	190.00	162.40	94.23	182.83	163.72	136.66	131.09	157.42	171.77
1977	202.00	170.46	97.29	197.84	174.64	143.00	127.13	165.80	186.00
1978	212.00	174.78	96.98	210.21	181.54	149.88	130.55	170.47	196.39
1979	220.00	171.56	98.14	207.94	176.57	160.20	122.36	173.31	204.27

Table A-2 (continued)

Gross Sector Output Indexes: Wood, Pulp, and Paper Products

	Logging	Sawing and Woodworking	Furniture	Pulp and Paper	Wood Chemicals
1950	59.32	41.37	7.54	22.10	60.14
1951	67.23	46.93	8.77	24.70	73.45
1952	66.76	51.00	10.19	27.35	76.55
1953	65.81	55.84	11.68	30.90	82.41
1954	74.80	58.25	15.01	33.97	80.05
1955	76.62	63.43	17.36	35.42	82.51
1956	79.56	64.59	18.66	38.31	82.83
1957	84.71	68.59	21.66	41.69	89.01
1958	88.80	78.22	26.70	44.54	94.40
1959	95.05	86.45	33.32	46.56	99.57
1960	90.58	87.99	39.46	48.66	101.03
1961	87.10	87.40	45.67	51.57	104.39
1962	87.78	87.95	51.38	55.19	106.60
1963	91.84	89.66	56.51	58.29	107.71
1964	95.36	93.24	59.96	62.66	117.42
1965	94.10	94.29	64.63	70.57	125.27
1966	93.15	91.43	69.53	78.10	121.31
1967	97.31	93.45	77.81	84.48	123.84
1968	97.72	94.33	85.66	88.74	120.49
1969	96.37	96.34	91.72	93.52	109.35
1970	100.00	100.00	100.00	100.00	100.00
1971	99.93	102.05	109.32	105.50	96.93
1972	99.61	102.12	119.07	110.25	96.36
1973	101.51	100.38	130.61	116.72	106.71
1974	101.22	99.34	141.47	121.75	114.38
1975	104.00	100.65	152.54	127.73	118.49
1976	100.39	97.80	161.28	133.95	117.24
1977	98.60	95.44	171.84	136.47	120.99
1978	94.61	92.49	182.32	138.82	121.34
1979	91.36	86.87	187.88	130.75	122.31

Table A-2 (continued) Index:1970 = 100

Gross Sector Output Indexes: Construction Materials

	Cement	Concrete	Wall Materials	Asbestos Cement	Roofing Material	Construction Ceramics	Other Materials for Construction	Glass and Porcelain
1950	9.38	1.29	25.18	8.84	21.41	6.01	16.58	25.46
1951	11.18	1.69	30.67	11.43	23.76	8.62	19.71	22.80
1952	13.04	2.09	35.40	14.37	26.99	11.97	22.97	21.49
1953	15.18	2.19	39.89	17.49	30.40	15.97	26.98	26.90
1954	17.94	3.08	44.48	21.37	33.43	20.79	31.80	31.68
1955	20.45	5.27	49.41	25.04	37.77	27.17	38.88	36.75
1956	22.04	8.83	51.50	29.88	40.19	32.81	42.01	41.65
1957	26.96	13.89	60.90	34.93	43.56	39.13	45.85	44.89
1958	31.71	19.71	72.70	38.90	48.60	44.12	54.02	49.67
1959	37.06	26.28	82.12	42.00	51.72	46.44	61.48	54.42
1960	42.51	33.65	86.84	48.23	56.24	51.72	68.55	59.64
1961	48.11	40.42	88.34	54.64	59.56	57.53	72.86	61.32
1962	55.28	47.55	85.66	60.76	63.71	62.81	72.94	68.19
1963	61.60	52.42	82.92	63.12	68.40	69.24	72.93	70.13
1964	67.21	57.88	83.56	66.55	74.59	74.50	73.17	77.24
1965	74.37	66.28	85.06	69.36	81.17	77.39	77.77	79.10
1966	82.13	75.67	88.73	76.16	86.73	80.21	80.89	82.91
1967	87.00	83.20	94.31	82.07	90.49	84.08	87.24	84.80
1968	90.56	87.11	95.52	87.05	88.62	87.52	91.45	88.51
1969	93.35	90.85	94.89	88.73	94.53	92.41	91.79	91.33
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	106.30	106.72	103.18	105.61	102.65	105.43	110.14	104.71
1972	111.05	112.54	105.76	111.36	106.25	109.62	116.48	113.48
1973	117.11	119.88	108.61	118.35	116.74	115.68	124.58	121.66
1974	123.53	126.22	109.78	124.87	126.27	120.40	130.65	130.13
1975	131.59	132.37	112.06	132.66	131.96	127.17	134.22	142.13
1976	134.15	137.27	112.11	138.77	141.34	129.91	141.06	147.89
1977	136.67	139.89	110.43	125.27	137.81	136.47	145.13	155.25
1978	137.76	141.91	109.23	126.44	140.06	142.87	151.82	161.65
1979	133.20	139.16	104.37	127.08	131.44	139.88	158.74	166.77

Table A-2 (continued)

Gross Sector Output Indexes: Light Industry

	Cotton Fabric	Silk Fabric	Wool Fabric	Linen Fabric	Hosiery and Knitwear	Sewn Goods	Other Light Industry
1950	44.62	9.24	28.55	36.41	17.74	19.54	37.42
1951	54.24	12.35	32.78	39.73	22.74	22.27	42.12
1952	57.72	15.70	35.41	32.14	24.83	25.00	42.26
1953	60.99	27.24	38.72	36.21	27.29	27.91	42.84
1954	64.78	35.23	44.91	36.05	31.54	33.19	45.25
1955	68.71	36.24	46.68	38.40	34.65	36.72	47.57
1956	64.56	52.55	50.12	49.97	35.12	40.43	49.63
1957	66.56	57.02	53.17	54.91	37.36	40.84	54.28
1958	70.03	60.23	57.23	62.22	39.79	44.72	60.10
1959	75.02	57.83	61.73	68.57	42.83	49.36	65.36
1960	78.64	58.92	65.34	73.00	45.72	52.97	68.92
1961	79.24	59.55	68.00	69.76	47.55	56.74	72.31
1962	79.88	68.67	70.51	68.56	50.20	58.99	73.69
1963	82.43	69.85	71.28	72.04	53.69	57.80	74.75
1964	87.22	72.60	71.99	76.94	61.37	56.39	76.41
1965	89.39	69.90	71.78	77.51	70.07	56.25	77.20
1966	92.70	75.83	78.69	83.73	77.58	61.88	81.37
1967	96.16	81.85	84.40	90.81	83.72	70.63	86.23
1968	99.41	82.90	90.29	95.62	89.41	81.58	90.69
1969	100.91	89.53	95.70	95.33	95.23	90.72	94.91
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	103.98	103.84	105.35	107.50	103.77	106.25	100.53
1972	104.37	110.82	107.02	109.62	105.35	107.50	96.22
1973	106.92	117.36	111.05	112.59	109.89	109.38	99.10
1974	107.67	125.77	115.70	112.59	112.50	112.50	101.64
1975	107.83	131.59	118.78	110.18	113.99	118.75	103.15
1976	110.19	139.53	123.56	114.14	116.94	125.74	105.80
1977	110.71	143.80	127.97	115.56	119.69	130.81	106.71
1978	113.25	147.91	130.54	117.40	122.04	135.89	106.79
1979	113.41	150.44	132.38	108.63	124.40	141.61	106.20

Table A-2 (continued)

Gross Sector Output Indexes: Processed Food

	Fish Products	Meat Products	Dairy Products	Sugar	Flour and Cereal	Bread Products	Confectionary Products	Vegetable Oils	Fruit and Vegetable Products	Other Food
1950	18.36	21.83	7.62	24.88	44.00	49.07	34.29	29.65	17.82	18.29
1951	22.75	24.40	10.10	29.40	49.08	51.86	39.99	33.06	19.97	20.91
1952	25.00	27.36	10.87	30.39	54.48	55.28	44.41	35.79	22.22	22.96
1953	28.68	30.76	12.07	34.14	57.45	58.39	48.69	41.51	24.53	26.01
1954	33.85	30.43	13.44	26.25	62.47	62.11	50.31	45.69	28.50	29.75
1955	39.22	33.38	16.20	34.02	69.65	65.84	47.96	41.41	32.99	31.64
1956	42.99	36.37	23.23	43.28	69.70	69.57	54.63	54.64	36.69	34.38
1957	40.53	40.63	28.93	44.55	72.54	73.91	54.21	60.62	38.44	37.24
1958	41.50	46.07	33.35	53.80	77.13	78.26	57.87	52.66	40.86	39.45
1959	44.13	58.10	38.89	59.41	80.26	79.19	61.71	68.16	44.58	42.36
1960	48.71	60.44	43.98	62.87	79.29	80.12	60.22	56.97	49.18	45.23
1961	51.20	58.02	47.88	82.28	81.52	84.16	62.36	65.32	54.86	48.06
1962	54.68	66.01	49.59	76.69	81.77	88.20	67.33	76.35	59.60	52.71
1963	59.74	74.84	50.66	61.52	77.64	90.06	71.17	79.07	68.69	57.76
1964	68.65	57.34	55.75	80.89	75.64	93.79	79.63	80.83	70.95	61.62
1965	71.93	72.29	62.74	108.01	83.75	94.41	79.94	100.11	68.52	66.46
1966	75.78	80.05	68.64	95.34	88.80	96.27	77.28	99.18	74.38	72.23
1967	81.15	89.90	75.51	97.26	90.30	96.89	81.98	109.94	88.56	77.90
1968	83.70	92.75	85.17	105.03	91.51	95.96	88.09	114.43	94.13	82.59
1969	91.66	91.12	93.42	100.99	92.56	99.07	95.48	107.85	88.06	93.20
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	103.60	114.25	100.68	88.54	102.51	103.42	99.79	104.63	107.25	101.86
1972	112.08	122.05	102.08	87.28	105.24	105.90	102.24	101.00	118.03	103.92
1973	119.84	117.45	109.60	104.97	103.28	105.90	108.56	95.09	124.66	94.42
1974	131.02	132.14	118.35	92.86	100.98	106.21	112.81	122.08	133.31	107.20
1975	145.49	139.28	121.41	101.98	98.02	109.32	112.12	119.52	137.62	114.38
1976	152.41	120.02	120.89	91.15	94.96	112.11	116.95	97.70	128.63	119.50
1977	150.43	131.38	125.61	117.97	104.54	111.18	121.93	103.16	134.18	119.71
1978	155.08	138.46	127.36	119.70	102.10	114.29	127.66	103.67	130.18	106.91
1979	164.99	139.09	127.82	104.69	106.22	114.91	130.15	97.73	141.33	118.39

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Appendix B

Computation of the Machinery Index

Creation of the machinery index requires two separate tasks:

- The relative weights of producer durables, consumer durables, and military machinery as a share of all machinery in the base year must be estimated.
- Indexes must be derived to drive these weights over time to record the growth in production.

These two tasks can be decomposed into the following six steps:

The first step is to determine which input-output sectors produce consumer and/or producer durables. Unfortunately, information was inadequate to divide consumption final demand between private and public consumption in the reconstruction of the 1972 input-output table. Thus, we are forced to use the 1966 input-output table in 1970 prices as the basis for splitting machinery deliveries to consumption into private and public components.[1] Of the 27 machine-building and metalworking (MBMW) sectors in the 1966 table, all except possibly one manufacture producer durables and only eight produce consumer durables based on patterns of deliveries to final demand.

The second step is to construct indexes representing each type of durable for as many of the machinery sectors as possible. These sector indexes are constructed in much the same way as they are for other branches. The products for every sector are valued in 1 July 1967 prices and then summed for every year. The one difference is that some of the sectors producing both consumer and producer durables are divided into two subsamples, resulting in two indexes for these sectors. Occasionally the sample for a given sector is so limited in scope that we are compelled to use the same index to move both producer and consumer durables.

Ideally we should have 35 indexes: 27 for the sectors that manufacture producer durables and eight for those making consumer durables. Because of information gaps reasonable indexes can be constructed for only 27 of the possibilities—20 producer durable sectors and seven consumer durable sectors. Moreover, in three of these sectors the same index is used for both kinds of machinery. The sectors with missing indexes and their estimated share of machinery value added in 1972 are as follows:

	Percentage Share of Value Added
Total	**31.8**
Cables—consumer durables	1.1
Cables—producer durables	NEGL
Casting machine & equipment—producer durables	0.1
Tools and dies—producer durables	1.3
Construction materials	
Machine & equipment—producer durables	0.5
Bearings—producer durables	1.0
Other machinery—nonconsumer durables	27.4
Abrasives—producer durables	0.4

Although the tabulation above casts considerable doubt on the coverage of the index for machinery, with nearly one-third of value added unaccounted for, it is somewhat misleading. The bulk of the missing share is in the "other machinery" sector, which is commonly believed to conceal a large military machinery component that is captured elsewhere in our index. If it is assumed that all of the "other machinery" is military and the totals are accordingly adjusted, the missing sectors combined add to less than 6 percent of the total.

The third step consists of estimating value added in 1972 for each sector and type of machinery (see table B-1). To do this we assume that every ruble of product

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[1] A version of this table appears in Vladimir G. Treml and Gene D. Guill, "Conversion of the 1966 Producer's Price Table to a New Price Base," in Treml, *Studies*, pp. 197-281.

Table B-1
USSR: Allocation of Value Added in the Machinery Sector to Producer Durables and Consumer Durables

(1) Sector	(2) Total Deliveries to Final Demand (million rubles)[a]	(3) Deliveries to Private Consumption (million rubles)[b]	(4) Consumer Durables Share (Percent)[c]	(5) Producer Durables Share (Percent)[d]	(6) Sector Value-Added (million rubles)[e]
Energy and power machinery and equipment	740.8	0	0	100.0	671.0
Electrotechnical machinery and equipment	2,842.2	455.0	16.0	84.0	3,149.3
Cable products	−243.0	6.9	100.0	0	516.5
Machine tools	1,349.7	0	0	100.0	858.1
Forge press machinery and equipment	297.5	0	0	100.0	200.7
Casting machinery and equipment	64.8	0	0	100.0	52.6
Tools and dies	157.5	0	0	100.0	605.9
Precision instruments	2,490.8	466.3	18.7	81.3	3,326.9
Mining and metal machinery and equipment	1,522.4	0	0	100.0	1,039.0
Pumps and compressors	1,693.8	505.8	29.9	70.1	1,008.4
Log and paper machinery and equipment	224.8	0	0	100.0	142.9
Light-industry machinery and equipment	488.6	35.1	7.2	92.8	352.0
Food-industry machinery and equipment	516.1	0	0	100.0	321.1
Printing machinery and equipment	56.3	0	0	100.0	39.1
Hoist-transport machinery and equipment	1,066.9	0	0	100.0	533.4
Construction machinery and equipment	1,205.3	0	0	100.0	574.8
Construction material machinery and equipment	320.8	0	0	100.0	222.7
Transport machinery and equipment	4,285.4	0	0	100.0	1,812.6
Automobiles	3,346.8	1,003.7	26.1	73.9	2,874.6
Agriculture machinery and equipment	3,099.6	0	0	100.0	2,129.4
Bearings	121.6	0	0	100.0	448.2
Other machinery	19,848.4	2,078.8	10.5	89.5	14,461.5
Sanitary engineering machinery and equipment	53.9	0	0	100.0	578.4
Other metalwares	1,322.3	959.5	72.6	27.4	1,961.9
Metal structures	−7.2	0	0	100.0	734.7
Repair machinery and equipment	10,282.2	0	0	100.0	8,470.4
Abrasives	−85.7	0	0	100.0	170.8
Total machinery	57,562.6	5,511.1			47,256.4

[a] Drawn from the 1972 producer prices input-output table.

[b] Drived from the 1972 table and the 1966 table as estimated in 1970 producer prices. For sectors with nonzero deliveries to consumption in 1972, the private consumption share of that total is assumed to be the same percentage as it is in the 1966 table.

[c] 100 x column (3)/column (2).

[d] 100 − column (4).

[e] See [a]. Total outlays − interindustry purchases.

[f] Column (4) x column (6)/100.

[g] Column (5) x column (6)/100.

Table B-1 (continued)
USSR: Allocation of Value Added in the Machinery Sector to Producer Durables and Consumer Durables

(1) Sector	(7) Value Added in Manufacture of Consumer Durables (million rubles)[f]	(8) Value Added in Manufacture of Producer Durables (million rubles)[g]	(9) Consumer Durables Index Status[h]	(10) Producer Index Status[h]
Energy and power machinery and equipment	0	671.2	NC	U
Electrotechnical machinery and equipment	509.2	2,645.0	EQ	EQ
Cable products[i]	516.5	0	NI	NI
Machine tools	0	858.1	NC	U
Forge press machinery and equipment	0	200.7	NC	U
Casting machinery and equipment	0	52.6	NC	NI
Tools and dies	0	605.9	NC	NI
Precision instruments	622.8	2,704.1	NC	U
Mining and metal machinery and equipment	0	1,039.9	NC	U
Pumps and compressors	301.2	707.2	U	U
Log and paper machinery and equipment	0	142.9	NC	U
Light-industry machinery and equipment	25.3	326.8	EQ	EQ
Food-industry machinery and equipment	0	321.1	NC	U
Printing machinery and equipment	0	39.1	NC	U
Hoist-transport machinery and equipment	0	533.4	NC	U
Construction machinery and equipment	0	574.8	NC	U
Construction material machinery and equipment	0	222.7	NC	NI
Transport machinery and equipment	0	1,812.6	NC	U
Automobiles	750.0	2,124.6	U	U
Agriculture machinery and equipment	0	2,129.4	NC	U
Bearings	0	448.2	NC	NI
Other machinery	1,514.6	12,946.9	U	NI
Sanitary engineering machinery and equipment	0	578.4	NC	U
Other metalwares	1,423.2	538.1	EQ	EQ
Metal structures[i]	0	734.7	NC	U
Repair machinery and equipment	0	8,470.4	NC	U
Abrasives[i]	0	170.8	NC	NI
Total machinery	5,657.7	41,598.7		

[h] Key

NC: This sector does not produce any consumer durables according to the input-output table.
NI: No reliable index is available for measuring either producer or consumer durables production in this sector.
U: The production index used is unique either to producer or consumer durables in this sector.
EQ: The same production index is used both for producer and consumer durables in this sector.

[i] The negative final demand of cable products, metal structures, and abrasives prevents determination of the producer and consumer durables shares. Since for cables the apparent consumer durables share is positive and the producer durables share is negative, we arbitrarily allocate all of that sector's value added to consumer durables. Since metal structures and abrasives apparently have no private consumption, we allocate their entire value added to the producer durables group.

shipped to final demand in a given sector embodies the same value added regardless of whether the machinery is a producer or consumer durable. Based on this assumption, the value added for each machinery type can be estimated by multiplying total sector value added by each component's share of deliveries to final demand.

Some bias is introduced by determining the relative importance of producer and consumer durables as described above. Deliveries of many machinery sectors to final demand categories other than private consumption undoubtedly include substantial amounts of purely military machinery; not all military hardware is produced in the "other machinery" sector of table B-1. This gives producer durables an excessively high weight and consumer durables too low a weight.

In the fourth step the producer and consumer durables indexes are calculated separately. Indexes of each type are converted into value added by linking them to the values derived in table B-1; the resulting values are then summed for every year.

The fifth step derives the production index for civilian machinery by using the control totals for 1972 value added of consumer durables and producer durables in table B-1, that is, 41,599 and 5,658 million rubles, respectively. Applying these weights to the producer durables and consumer durables indexes and adding them together provide the index for civilian machinery.

Finally, the civilian and military machinery indexes are combined into an index of total Soviet machinery production. The weights are obtained according to the following procedure. The figure for military machinery production in 1972 (after deducting common use durables) is converted to value added by using the ratio of total machinery final demand to value added as given in the reconstructed 1972 input-output table. The military share of value added in machinery production in 1972 is derived by comparing this value with total value added in the machinery branch. The indexes of output for civilian machinery and military machinery are then used to find the shares in the base year, 1970—for military machinery, about one-third and for civilian machinery, about two-thirds.

Part III. AN INDEX OF AGRICULTURAL PRODUCTION IN THE USSR

By Barbara Severin and Margaret Hughes

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Vestnik statistiki (Herald of Statistics)	*Vest stat*
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An Index of Agricultural Production in the USSR

I. Summary

The CIA index of Soviet net agricultural production measures trends in the value of agricultural production available for sale and home consumption for each year in the USSR since 1950. The output index measures production in the year in which it is produced, although some of this production may be marketed or consumed in subsequent years. The index is devised to measure agriculture's contribution to Soviet GNP. The index also has served as the basis for international comparisons of farm output and for studies of productivity in Soviet agriculture. The following tabulation shows the relatively close correspondence of the CIA index and other major indexes of Soviet agricultural production.

	Average Annual Percentage Rates of Growth		
	1951-79	1961-70	1971-79
Indexes of net output			
CIA	3.0	3.7	0.9
US Department of Agriculture	3.1	3.6	1.5
Indexes of gross output			
CIA	3.2	3.6	1.2
Official Soviet	3.2	3.3	1.4

The CIA index is based on output of 28 individual crops, ten livestock products, and four items of livestock inventory change. When the CIA index is calculated on a gross basis and compared with the official Soviet index of gross output, the livestock component covers about 95 percent of the Soviet measure of livestock products and the crop component about 80 percent of crop production. We assume that the trend in output of residual crop and livestock products is the same as that of the price-weighted aggregate of commodities included in the sample. In the CIA index, grain and potatoes make up over half of crop output while meat and milk dominate livestock production. The CIA index omits production of hay and other forage crops, decorative plants, fishing, fur production, and minor livestock products such as feathers, beeswax, and silkworm eggs. Also excluded are manure and "unfinished production" included in the Soviet definition of gross agricultural production.

Output estimates in the CIA index are largely based on Soviet agricultural statistics. Estimates are made, however, where data are missing. Official production statistics are corrected as necessary for measurement error, or where Soviet data seriously overstate usable or standard-weight output. The physical production data for the commodities in the index are aggregated for the most part with average prices received by all producers for products sold in 1970, into two subsector indexes—one for crops and the other for livestock output. Average realized prices for the majority of commodities can be estimated with adequate reliability. In some cases, however, state procurement prices had to be substituted even though they are less desirable since they exclude collective farm market prices. Despite this bias, sensitivity tests indicate that price weights are not a major source of error in the index.

Much less certain are the estimates of intra-agricultural use of farm output—seed and feed—that are deducted from gross output to derive net agricultural production. Seed estimates are based on annual sown area data and on officially prescribed seeding rates for a fixed period. The use of a constant seeding rate probably introduces an element of error, yet seed estimates are relatively more reliable than those for feed. Although estimates of grain fed derive from official data, estimates of potatoes fed are particularly tentative for years where official data are lacking. Only occasional Soviet statements on quantities of whole milk and vegetables fed are available to derive estimates of quantities fed. Quantities of other commodities fed are too small to be a source of substantial error.

A potentially more important source of error is the paucity and unreliability of published Soviet agricultural statistics. Although data are more plentiful now than 10 or 20 years ago and reliability may have improved, many gaps remain. Estimates must be made, especially for agricultural products used in the production process. The accuracy of important series is also questionable. For example, statistics on private sector production, which are based on sampling, probably contain a considerable margin of error, with particular consequences for the measurement of output in the livestock sector. Further reducing reliability of estimates of net output in the livestock sector is the scarcity of published feed statistics which, in any case, are believed to be less reliable than official commodity output data. Deliberate falsification is another source of diminished reliability in agricultural statistics. Grain output statistics for the early 1950s published nearly a decade later almost certainly reflect deliberate understatement of the crop. Examples of recent falsification can also be found. Because most recent falsification appears to originate at lower levels in the reporting process, it is unclear how it impinges on the overall aggregate data.

Soviet gross output statistics also include a large element of waste. For example, there is considerable evidence to suggest that the usable quantities of grain, sugarbeet, potato, vegetable, fruit, sunflower seed, and egg production are smaller than official production statistics report. Moreover, standard weight of these commodities may be even less. Adjusting for waste is very difficult because of the shortage of data. We confine our deductions for waste and losses to grain and sunflower seed output, where we believe data exist to make such adjustments feasible. The waste in sugarbeet production is eliminated by use of procurement statistics—which are reported in standard weight. Failure to deduct for waste elements in other crops is potentially the most serious cause of overstatement of net output in the CIA index. However, we adopted the policy of not imposing arbitrary adjustments on official Soviet data where no information exists on which to base such adjustments. To the extent that these adjustments are proportionately constant over time, the trend is not distorted.

Because of these and other deficiencies in available Soviet statistics, we believe our index is a more reliable measure of trends in agricultural production than of levels of output. In this context it is a more reliable indicator of the change over a period of years than of changes between any two consecutive years.

The CIA index shows net output growing more rapidly in the 1950s and slowing steadily during the 1960s and 1970s. This trend is clearly seen in output of the livestock sector. Crop output grew more rapidly in the 1960s than in the 1950s but growth fell to rates below either of these periods in the 1970s. The rapid growth of the livestock sector in the 1950s caused the share of livestock output in total net production to increase from 45 to 54 percent between 1950 and 1960. Since 1960 share of livestock output in net agricultural production has remained unchanged.

	Average Annual Percentage Rates of Growth		
	1951-60	1961-70	1971-79
Total output	4.3	3.7	0.9
Crop production	2.6	3.7	0.7
Livestock production	6.1	3.7	1.0

We applied several sensitivity tests to the index to assess changes that would be caused by different discounts for waste, different (1960) price weights, and different approaches to valuing feed and livestock inventory. None of the tests changed average annual growth of total output for the 1951-79 period by more than one-tenth of one percentage point. The livestock index was most affected by the use of 1960 prices while the crop index was most altered by removing the discounts on grain and sunflower seed. Because 1970 prices are relatively more favorable to livestock products than 1960 prices, the switch to 1960 prices caused the largest shift in the shares of total output originating in the crop and livestock sector.

We compared the CIA index to three other indexes of Soviet agricultural output. Surprisingly, for the 1960s and 1970s, growth rates of total output calculated from these indexes differ by less than half a percentage point, although the indexes themselves vary widely in coverage and weighting:

- The FAO index incorporates a recently revised methodology and thus covers only 1966 forward; it is based on a large sample.

- The USDA index covers all years since 1950 and is also based on a large sample, but is weighted with average prices received by farmers in Western Europe during 1969-71. The latter diverge somewhat from Soviet relative prices.

- The official Soviet index measures gross rather than net output, that is, it includes the value of crops and livestock products used in agricultural production as well as unknown quantities of waste. The CIA index is calculated on a gross basis for this comparison.

The major difference between the CIA index on a gross basis and the Soviet index of gross agricultural output is the heavier weight placed on livestock production in the CIA index. In the Soviet index since 1960, crops and livestock have contributed equally to gross output, while in the CIA index during this period the livestock sector accounts for about 54 to 56 percent of gross output. Nevertheless, for the 1951-79 period as a whole, gross output in the Soviet and CIA indexes and net output in the CIA index all grow at about the same rate. The largest discrepancy in growth rates occurs in 1951-60, when the official index shows much more rapid growth than the CIA index of net output. When we adjust the CIA index to a gross basis and use the same price weights as are in the official Soviet index, the differences in growth narrow. Some of the discrepancy in the shares of crops and livestock in total output remains, however, because we do not include the value of hay and green feed in crop output. Moreover, the CIA index omits a number of other crops included in the official Soviet index.

II. Introduction.[1]

The CIA index of agricultural production is a key element in CIA's estimates of growth in Soviet GNP. Because about 16 percent of GNP originates in agriculture, the GNP measure must incorporate a reliable indicator of year-to-year changes in value added in agriculture—especially since weather causes wide fluctuations in agricultural output with substantial effect on annual changes in GNP. The USSR does not publish an index of value added in agriculture, however.[2] We estimate value added by first deriving net agricultural output, that is, by reducing the value of gross production by the value of output consumed in the production process (seed and feed) and by waste. When the value of agriculture's purchases from other sectors of the economy—fuel, fertilizer, spare parts, services, and the like—are subtracted from net output, the result is value added.[3]

This paper describes and evaluates the CIA index of net agricultural output. First, the derivation of the sample coverage and 1970 price weights is described. We then consider the validity of Soviet agricultural statistics on which the index is based. We present our estimates of seed, feed, and waste. After describing the construction of the index of net output, we apply sensitivity tests to assess the effects of different waste measures and price weights. Finally, we compare the structure and trends in the CIA index with those in three other indexes of Soviet agricultural output, including the official Soviet index of agricultural production. The details of our estimates and the sources for all data used in the index are presented in the appendixes.

III. Construction of the Index

A. Coverage of the Sample

Estimates of net agricultural output are derived by aggregating the value of production of 28 individual crops, 10 livestock products and four items of livestock inventory change using the 1970 average prices received by all producers.[4] Agricultural commodities are included in the index in the year in which they were produced although some of the commodities may be marketed or consumed in subsequent years. We divide agriculture into two subsectors: crops and livestock. Net production of the crop sector is the value of crop production available for sale outside the crop sector and for direct consumption by farm households — that is, gross crop production minus the value of seed grain and seed potatoes and minus waste elements in grain and sunflower seed production. In theory, waste should be deducted for all crops, but lack of data makes it impossible to estimate these quantities for crops other than grain and sunflower seed. Crops used exclusively within agriculture for feed such as hay, corn for silage, feed roots, and so forth, are not counted. Similarly, to obtain "net" output of the livestock sector, gross output is reduced by animal products used for feed and hatching eggs. When the two sectors are aggregated to measure total net agricultural output, the value of commodities transferred between them for use in the production process is subtracted to avoid double counting. These transfers represent feed produced in the crop sector but consumed by livestock such as grain, potatoes, whole milk, and vegetables. Because hay and other forage crops are not included in crop output, they are not part of these transfers. Data are lacking to estimate transfers such as manure from the livestock sector to crop production. When the two subsector indexes are considered independently, feed is counted as crop output and also is included implicitly in the value of livestock output. In measuring total net output, we subtract the value of crops and whole milk fed as well as hatching eggs from livestock output. Thus, the value of hay and other forage crops is automatically included in net livestock output. The CIA index, then, defines net livestock production as gross output minus a) the value of selected agricultural commodities fed to livestock and b) the value of hatching eggs. Because our crop index and feed deduction make no allowance for hay and other forage crops, the value of net livestock output is somewhat overstated relative to the value of net crop output. The value of these feed crops is small, however, and its exclusion does not have a significant effect on the results.[5] Below, we define the sample categories in more detail.[6] We touch briefly on waste as it affects each category; a fuller discussion of the waste problem can be found in section V below. Table 1 shows the ruble value and percentage distribution of agricultural production in 1970 according to our index.

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[1] The authors wish to thank John Carroll, Constance Krueger, and Luba Richter for their assistance in the preparation of this paper. They are particularly indebted to Constance Krueger, whose meticulous research is largely responsible for the prices and the seeding rates used in construction of the index.

[2] The USSR publishes data on net output of agriculture in current prices in official national income statistics. This is not comparable to the Western definition of net output, however, because the Soviet series deducts all material inputs and not just those produced within agriculture. The Soviet national income series excludes depreciation, which is part of value added and includes the value of services purchased from outside the sector such as transportation, recreation, financial services, and the like which are not included in the Western definition of value added. Thus the Soviet series does not correspond exactly to our definition of value added, although it is probably closer in concept to value added than to net output as measured by our index. See CIA ER 78-10505, *USSR: Toward a Reconciliation of Marxist and Western Measures of National Income*, October 1978.

[3] Estimates of purchases by agriculture from other sectors are discussed in the paper by John Pitzer, JEC, *GNP, 1950-80*.

Grain and Potatoes. Grain and potatoes together amount to 60 percent of net crop output. We account separately for nine types of grain: wheat, rye, corn, barley, oats, rice, millet, buckwheat, pulses, and "other grains." Other grains amounted to less than 1 percent of the value of grain output in 1970.[7] The following tabulation shows the value of grain production in 1970. Wheat and barley together account for over two-thirds of the ruble value of net grain output. While wheat has always been the single most important grain, barley has been in second place only since the early 1960s. Growth in barley production is associated with the emphasis on rapid expansion of feed grain output. Before then, rye was the second largest grain crop in value terms.

	Million Rubles	Percent
Wheat	7256.0	53.1
Rye	990.5	7.3
Buckwheat	224.0	1.6
Rice	307.4	2.2
Corn for grain	1009.6	7.4
Oats	839.4	6.2
Barley	2282.9	16.7
Millet	138.2	1.0
Pulses	600.9	4.4
Other	8.3	0.1
Total	13657.2	100.0

---

[4] The index is a Laspeyres quantity index where

$$I_t = \frac{\sum_{i=1}^{n} P_{70,i}\, Q_{t,i}}{\sum_{i=1}^{n} P_{70,i}\, Q_{70,i}}$$

[5] While the CIA index is primarily used to derive value added in agriculture, with some adjustments it can also be used to gauge trends in output of the crop and livestock sectors available to consumers. For this purpose, net crop output is defined as gross output less seed, waste, and grain, potatoes, and vegetables used for feed. Net livestock output is defined as gross output less whole milk fed and eggs for hatching. Redefining the subsectors in this way raises the growth in livestock output and reduces the growth in crop output reflecting the relatively rapid gains made by the Soviet consumer in consumption of livestock products.

[6] Details on the derivation of the quantity data used in the index are presented in appendix A. The derivation of 1970 average realized prices is explained in appendix B.

[7] These include sorghum, spelt, vetch, lupin, seradella and other minor miscellaneous grains.

Gross potato production includes without differentiation the so-called "standard" quality output and the inferior, nonstandard production grade. To measure net output of grain and potatoes, gross output is reduced by quantities used for seed and, in the case of grain, by waste. No waste is deducted from gross output of potatoes because data are lacking. (Our estimates of seed are discussed below in sections IV and VI.)

Vegetables and Fruits. Production of vegetables and fruit accounted for almost one-fifth of net crop output in 1970 with the value of output evenly split. Until the late 1960s, however, vegetables predominated. Fruit production has continued to gain and exceeded annual average vegetable production in 1975-79. The structure of production in 1970 is shown below.

	Million Rubles	Percent
Fruit	3296.6	48.8
Beets	128.3	1.9
Cabbage	711.4	10.6
Carrots	198.0	2.9
Cucumbers	485.7	7.2
Onions	866.4	12.8
Tomatoes	933.7	13.8
Other vegetables	136.5	2.0
Total	6756.6	100.0

Official Soviet statistics on vegetable production—published only as a total—include vegetables raised in "open beds" (field grown), and in hothouses and heated beds. Field-grown vegetables are by far the largest category of production.[5] Vegetables in our sample include carrots, beets, onions, cabbage, cucumbers, and tomatoes. Vegetables not listed separately in the CIA index but included in other vegetables (parsley, mushrooms, squash, turnips, radishes, lettuce, spinach, dill, and so on) accounted for only 2 percent of the value of vegetable output in 1970. Fruit output includes grapes, berries, and other fruit (apples, pears, quinces, cherries, plums, apricots, peaches, and citrus fruit). Fruit is a single entry in the CIA index because insufficient data exist to derive annual estimates of individual types. Like grain and potatoes, gross output of vegetables and fruits should be reduced for waste to convert total output to a net basis. Lack of a consistent time series of required deductions prevent this adjustment, although waste is no doubt considerable.

Table 1

USSR: Value of Agricultural Output, 1970 [a]

Category	Number of Components	Million Rubles	Percent	
Grain	10	13657.2	35.5	
Potatoes	1	9286.6	24.1	
Vegetables	7	3460.0	9.0	
Oil crops	3	1303.6	3.4	
Fruits, berries, nuts	1	3296.6	8.6	
Sugarbeets	1	1856.0	4.8	
Cotton	1	3823.9	9.9	
Tobacco	1	475.6	1.2	
Makhorka	1	17.5	negl.	
Fiber flax	1	1068.9	2.8	
Tea	1	256.3	0.7	
Net crop output		**38502.2**	**100.0**	**46.1**
Meat	5	28797.7	51.5	
Milk	1	16271.1	29.1	
Eggs	1	4074.0	7.3	
Wool	1	1947.9	3.5	
Honey	1	336.0	0.6	
Silk cocoons	1	171.9	0.3	
Livestock inventory change	4	4366.8	7.8	
Gross livestock output		**55965.3**	**100.0**	
Less: feed hatching eggs		10724.6 185.4		
Net livestock output		**45055.3**		**53.9**
Net agricultural output		**83557.4**		**100.0**

[a] In 1970 average realized prices. A more detailed version of this table covering the years 1950-79 can be found in appendix A.

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[5] Melons are often grouped with vegetables in Soviet statistics. However, melons are not included in official vegetable output statistics, although they are included in official acreage reports and in vegetable consumption statistics. Insufficient data are available on production to include melons in the index.

Technical Crops. Our sample, shown in the following tabulation, includes oilseeds, sugarbeets, cotton, tobacco, makhorka, fiber flax, and tea. Cotton alone accounts for almost half of the value of technical crop production. Sugarbeets, sunflower seed, and fiber flax account for almost all of the remaining half. These shares have not changed appreciably over time.

	Million Rubles	Percent
Sunflower seed	1057.0	12.0
Soybeans	156.5	1.8
Other oil crops	90.0	1.0
Sugarbeets	1856.0	21.1
Cotton	3823.9	43.5
Tobacco	475.6	5.4
Makhorka	17.5	0.2
Fiber flax	1068.9	12.1
Tea	256.3	2.9
Total	8801.7	100.0

Among oilseeds, we count separately only sunflower seed and soybeans. Together, these account for 93 percent of total oilseed output.[9] Other crops grown exclusively for oilseeds but not listed separately include castor beans, flaxseed, mustard seed, and at least 11 other minor oilseeds. A waste discount of 8.0 percent is applied to sunflower seed output. In addition, oilseeds are produced as a joint product with cotton and hemp. Cottonseed is included in cotton production which is measured as raw, unginned cotton including seeds. Hemp and associated seed, a minor crop, is not included.

Meat. Meat output in our index is measured at slaughter weight and includes meat on the bone, all raw fats, and edible offal derived from livestock and poultry slaughtered in goverment-operated packing plants, on socialized farms, and by private sector households.[10] We account separately for beef and veal, mutton and kid, pork, poultry, and other meat. Other meat includes rabbits, horses, deer, camels, and game, and amounted to 3 percent of the value of meat output in 1970. The shares of individual types of meat in total output have changed somewhat. The share of poultry has doubled from 6 percent in 1950 to 13 percent in 1979, while mutton dropped from 1[illegible] percent to 4 percent. The share of beef dropped from 47 percent to 35 percent between 1950 and 1955 and slowly recovered to 47 percent in 1979. Shares of pork demonstrated the reverse trend, climbing from 31 percent to 42 percent between 1950 and 1955 and then declining to 33 percent in 1979. Since 1950, however, beef, veal, and pork have accounted for at least three-quarters of the value of total output. The following tabulation shows the distribution of meat output in 1970:

	Million Rubles	Percent
Beef and veal	13234.4	46.0
Pork	10230.8	35.5
Mutton and kid	1827.6	6.3
Poultry	2536.1	8.8
Other meat	968.8	3.4
Total	28797.7	100.0

Other Livestock Products. Milk, eggs, wool, honey, and silk cocoons are other livestock products in the index. All are shown in table 1. Gross meat and milk production, however, roughly accounted for 80 percent of gross output of livestock products in 1970. This share was almost 90 percent in 1950, and has risen since 1970 to 84 percent in 1976-79. Milk output includes all milk from cows, sheep, goats, and mares. An estimate of whole milk fed to livestock is deducted in deriving net livestock production. Also excluded from net output are eggs used for hatching.

[9] Earlier versions of this index accounted separately for flaxseed, castor beans, and mustard seed in addition to sunflower seed and soybeans. In revising the index for this paper, it was established that continuous time series of official data for these other oilseeds were not available. Our category "other oil crops" is a residual derived by subtracting sunflower seed and soybean production from Soviet data on output of all oil crops.

[10] Edible offal includes the internal organs of the animal: lungs, liver, heart, kidneys, stomach, and others. It also includes the head, brains, feet, and other parts that are used for food in the USSR. Soviet statistics formerly grouped these products in four categories. Sometime during the 1960s, these were collapsed to two.

Changes in Livestock Inventories. The CIA index measures the annual change in the number of cattle, hogs, sheep and goats, and poultry.[11] Published Soviet herd statistics do not regularly include other domesticated animals such as camels, donkeys, and reindeer. The increase or decrease in numbers is valued at the average realized price per live animal in 1970, which is derived from the average weight of animals sold to procurement organizations in that year. We assume that the larger average weight of mature animals offsets the lower per animal weight of young animals so that the average weight for the entire herd is equal to the average weight of animals designated for slaughter. Although average animal weight changes every year, sensitivity tests presented below indicate that, for most years, the index is not much affected by failure to take this change into account.

General Assessment.
Sufficient Soviet data are available to assess the coverage of the CIA index relative to the more comprehensive Soviet measure of gross agricultural production.[12] Table 2 compares the commodities included in both indexes.[13] The CIA index includes the commodities shown in column one; the Soviet index includes the commodities in both columns.[14] Although the CIA sample seems to exclude a long list of crops, most of the excluded crops are used entirely within agriculture and are not part of output available for sale and home consumption. Crops omitted from the CIA index that are not produced for intra-agricultural use include the additional technical crops such as hops, as well as flowers and decorative plants, and some items of inventory change. In addition to the broader coverage shown in table 2, the Soviet index has finer detail for many of the basic commodities. For example, the CIA index is based on output of nine specific grains while the Soviet index includes 17 individual types. The CIA index accounts separately only for sunflower seed and soybeans under oilseeds; the Soviet index includes 16 individual items in this category. The coverage of the livestock sector is conceptually closer in the two indexes than that for the crop sector despite the differences in measurement of meat output.

The coverage of the CIA index can also be assessed by comparing the ruble values of gross agricultural output as measured by the Soviet and CIA indexes.[15] When the two indexes of gross output are compared, the CIA index includes 90 percent of Soviet output of agriculture. Over 95 percent of livestock products and 80 percent of crop output are covered.[16] The CIA index would show somewhat greater coverage of crop production if estimates of hay, pasture feed, and other forage crops had been included when converting the CIA index to a gross output basis. The comparison suggests that the CIA index has generally good coverage probably accounting for roughly 95 percent of total output net of intrafarm use of crops.

B. 1970 Price Weights

Each commodity in the index of agricultural production is valued at the weighted average of prices paid by the USSR's three major purchasers of farm products in 1970. For a number of commodities, such as vegetables and meat[17] prices received by farm producers vary substantially depending on the purchaser. The largest purchasing organization is the Ministry of

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[11] The change in numbers of horses is excluded because horses are included in the Soviet definition of agricultural capital stock. Increments in horse inventories, therefore, are not part of current net output available for sale.

[12] Gross output includes the value of all agricultural products and makes no deduction for agriculture's use of its own output in the production process.

[13] A complete list of the commodities in the Soviet index is available in F. F. Savitskiy et al., *Spravochnik po planirovaniyu sel'skogo khozyaystva*, Moscow, 1974, pp. 462-464.

[14] Meat output is measured quite differently in the two indexes. In the Soviet index, output is equal to the difference in liveweight of animals at the beginning and the end of the year minus the weight of purchased animals plus the liveweight of all animals sold for slaughter.

[15] To make this comparison, commodities in the CIA index on a gross basis were valued in the 1965 comparable prices used in the Soviet index. In addition, the value of seed and feed were added back to create a CIA measure of gross output.

[16] A detailed discussion of the differences in the growth rates and the structure of the CIA and Soviet indexes is presented below in section VIII B.

[17] Prices for meat are based on procurement prices for live animals and are converted to a slaughter weight basis. See appendix B.

Table 2

Commodities Included in CIA and Soviet Indexes of Agricultural Production

Components of CIA Index	Addditional Components Used in Soviet Gross Output of Agriculture
A. Crops	
1. Grain	1. Byproducts of grain crops (straw, chaff, and so forth)
2. Technical crops	2. Technical crops
a. fiber crops, cotton and flax	a. other fiber crops b. essential oil raw materials
b. sunflower seed	c. medicinal plants
c. soybeans	d. chicory root
d. other oil seeds	e. seeds and planting material for technical crops
e. sugarbeets	f. other technical crops (hops, tea, and so forth)
f. tobacco and makhorka	g. Other oilseeds
g. tea	
3. Potatoes	3. Feed crops
	a. root crops
	b. hay
	c. green fodder
	d. silage crops
	e. other feed crops
	f. seeds of feed crops
4. Vegetables	4. Crops for green manure
5. Fruits, berries, and nuts	5. Flowers and decorative plants
	6. Expenses for starting and caring for perennial plantings
	7. Unfinished production (change in value during the year of expenses for sowing winter crops and soil preparation)
B. Livestock	
1. Meat (slaughter weight)	1. Weight gained by livestock during the year (liveweight)
a. beef and veal	
b. pork	
c. mutton and kid	
d. poultry	
e. other meat	
2. Change in number of livestock	2. Offspring and increase of working livestock (horses, camels, donkeys and mules) and of reindeer
3. Milk	3. Fur-bearing animals (hides and offspring)
4. Eggs	4. Change in number of bee colonies
5. Wool	5. Fish breeding (young fish and fish catch)
	6. Other animal products (hair, horns, feathers, manure, beeswax, silkworm eggs)
7. Silk cocoons	

Procurement, which buys agricultural commodities from state farms, collective farms, and individual private sector producers. Other state purchasing organizations are the Central Union of Consumer Cooperatives, and the Ministries of the Food Industry, Meat and Dairy Industry, Light Industry, and Trade. The second major sales channel for farm products is the system of collective farm markets where producers sell agricultural commodities at prices determined largely by the interplay of supply and demand. Prices paid in collective farm markets normally exceed procurement prices, because products sold through this channel are of higher quality or because a given product is scarce or unavailable in state retail stores. For example, in 1970 the average collective farm market price for milk was almost double that paid by procurement organizations.

In practice, average realized prices could not be obtained for each commodity in the index. Surrogates, some more satisfactory than others, had to be used in a number of cases. Although average realized prices for all grain, vegetables, and meat can be estimated, the prices needed to value each individual type of grain, vegetable, and meat are missing. Data on average collective farm market prices for individual commodities are especially scarce and must be estimated in many cases. Soviet literature provides relatively ample data on list procurement prices [18] for individual commodities but obtaining USSR-wide averages of prices actually paid in a given year is difficult. In the case of honey and some oilseeds, we had to substitute RSFSR list procurement prices. [19] Collective farm procurement prices paid in 1970 are

[18] List procurement prices are paid by procurement organizations for products of standard quality. Prices for a given product are differentiated by region in the USSR. In Belorussia, for example, in 1970-72 there were 113 price zones for milk; the milk prices ranged from 170 to 620 rubles per ton (N.I. Goryachko, *Obosnovaniye sistemy zakupochnykh tsen*, Minsk, 1978, p. 20). List prices exclude adjustments made at the time of sale for product quality. Grain with moisture content above standard levels, for example, will be purchased at prices below list prices. List procurement prices also exclude bonuses paid for sale above the plan quota.

[19] Although the RSFSR prices are only for state and collective farms and exlude the private sector, this is not a source of significant error. The private sector produces almost no oilseeds, and the price for honey was made the same for all producers in 1970 (*Zakupki sel'skokhozyaystvennykh produktov*, no. 9, 1970, p. 1).

better surrogates in that they include price bonuses and penalties, but they are for one producer only. The average of procurement prices paid in 1970 to all producers is the best surrogate for average realized prices.

The following tabulation shows where substitutions have been made for average realized prices. Each price used in the index is derived in appendix B.

Average Realized Prices	RSFSR List Procurement Prices	Procurement Prices Paid to Collective Farms	Average Procurement Prices Paid to All Producers
Grain	Oil crops (except sunflower seed)	Sugarbeets	Fruit
Potatoes	Honey	Flax fiber	Cotton
Vegetables		Tobacco	Tea
Meat		Makhorka	
Livestock inventory		Silk	
Milk			
Eggs			
Wool			
Sunflower seed			

The error introduced by these substitutions probably is small. Average realized prices have been used for the most important commodities in the index. In the two cases where list procurement prices have been used the value of output is small. The value of commodities priced with collective farm procurement prices probably is overstated; a comparison of procurement prices for commodities where we have prices for state farms, collective farms, and private producers shows that average procurement prices paid to state farms are often somewhat less than those paid to collective farms and private producers. Since collective farm market sales of oilseeds, flax, tobacco, makhorka, silk, cotton, and tea are insignificant, procurement prices in these cases are an acceptable substitute for average realized prices. The average procurement prices understate the value of output significantly only in the case of fruit and honey, where collective farm market sales are substantial. Cotton and tea are sold exclusively through the state procurement system.

Valuing commodities fed at average realized prices overstates feed use if the portion fed is of much lower quality than the portion marketed. In the case of potatoes and vegetables, a lower price is used. By virtue of the calculation, quantities of grain fed are standard weight so should be priced at average realized prices. Whole milk fed, however, may not be of standard butterfat content—the basis for the price—so could be overvalued. The effect of this overstatement is small; sensitivity tests indicate that valuing feed at Soviet cost of production does not affect trends. (See section VII.)

C. The Index

The CIA index of Soviet net agricultural production shows steadily declining growth after 1960. This trend is especially prominent in net output of the livestock sector. Table 3 shows indexes of output for major commodity groups in benchmark years related to the base year 1970, while the following tabulation summarizes growth rates for these commodities.

	Average Annual Percentage Rates of Growth			
	1951-79	1951-60	1961-70	1971-79
Grain	2.5	3.4	4.0	−0.3
Potatoes	0.2	−0.8	2.0	−0.5
Fruits and vegetables	5.1	6.5	5.3	3.3
Technical crops	3.3	4.6	4.0	1.3
Net crop output	**2.4**	**2.6**	**3.7**	**0.7**
Meat	4.1	6.1	3.5	2.7
Milk	3.4	5.7	3.0	1.3
Other	4.6	9.0	5.5	−0.9
Net livestock output	**3.7**	**6.1**	**3.7**	**1.0**
Net agricultural output	3.0	4.3	3.7	0.9

Among crops, fruits and vegetables grew most rapidly over the 1951-79 period, rising from 10 percent of net crop output in 1950 to 22 percent in 1979. Growth in grain output held at fairly steady rates while potato output posted almost no growth. At the same time, potatoes fell from 40 percent of net crop output in 1950 to 22 percent in 1979. Crop output shows more variation in growth rates than the livestock sector where growth rates slowed over the entire period. By 1971-79, only fruits, vegetables, and meat were growing at average annual rates above 2 percent. For many

Table 3

USSR: Index of Net Agricultural Production, Selected Years [a]

	1950	1955	1960	1965	1970	1975	1976	1977	1978	1979
Grain	48.3	56.4	67.2	66.0	100.0	76.6	120.5	103.3	131.6	97.7
Potatoes	88.9	66.9	82.2	88.8	100.0	90.4	87.9	86.2	89.3	95.4
Fruits and vegetables	31.8	47.5	59.5	75.8	100.0	115.8	124.0	122.0	127.3	133.7
Technical crops	43.2	56.8	67.5	87.6	100.0	104.4	114.9	118.8	112.0	111.9
Net crop output	**54.0**	**57.5**	**69.6**	**78.2**	**100.0**	**93.2**	**112.0**	**106.0**	**116.2**	**106.7**
Meat	39.1	51.5	70.7	80.3	100.0	122.9	112.5	120.7	126.9	126.8
Milk	42.5	51.8	74.3	87.4	100.0	109.4	108.0	114.4	114.0	112.4
Other livestock products (including inventory change)	24.7	47.6	58.3	85.6	100.0	58.1	82.7	106.5	97.8	92.1
Net livestock output	**38.4**	**54.1**	**69.3**	**86.7**	**100.0**	**102.4**	**101.1**	**115.3**	**113.3**	**109.0**
Net agricultural output	**45.6**	**55.6**	**69.4**	**82.8**	**100.0**	**98.2**	**106.1**	**111.0**	**114.6**	**107.9**

[a] 1970 = 100

commodities, 1971-79 growth rates were less than half of the rates posted for 1951-60.[20]

IV. Evaluation of Official Soviet Statistics

The accuracy of the CIA index of agricultural output ultimately depends on the reliability of the Soviet statistics used to construct it. Western observers have long criticized Soviet agricultural statistics for being unavailable, inaccurate, inconsistent over time, or not comparable with Western measures of farm output. In constructing the CIA index of Soviet agricultural production, we have made some adjustments to compensate for these deficiencies in Soviet statistics.

A. Availability

Availability of Soviet statistics is a broader problem than the mere scarcity of data on physical output of commodities. Data on commodity use are also scarce as are the definitions needed to interpret some of the published statistics correctly The reliability of the CIA index is affected more by the absence of statistics on the use of farm products for seed, feed, and the like than by a shortage of output data. Although troublesome shortages of production data still exist, more utilization data and definitional material have become available and the accuracy of statistical reporting may have improved somewhat.

Earlier, Western investigators puzzled, for example, over whether milk output statistics were recorded in physical weight or converted to standardized butterfat content. How milk fed to calves was reported in output statistics was also ambiguous.[21] Definitional material now available explicitly states that gross output of milk is in physical weight, while procurement statistics are in terms of standardized butterfat content.[22] The issue of milk fed to calves has also been clarified: milk sucked directly by calves is excluded from gross output. Milk fed by other means is included.[23] Part of the problem of understanding milk statistics remains, however, because a large share—nearly 40 percent—of milk output is not marketed and must be estimated from survey data. Moreover, much of the data on milk marketings is a calculated milk equivalent of marketed cream. Mistakes in the conversion factor could result in erroneous figures for total milk output.

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[20] Poor weather in 1979 depressed crop growth and thus growth in total agricultural output. If the comparisons were for the period 1971-78, crop output would have grown at an average annual rate of 1.9 percent, and net output at 1.7 percent per year.

[21] D. Gale Johnson and Arcadius Kahan, "Soviet Agriculture: Structure and Growth," *Comparisons of the United States and Soviet Economics*, U. S. Congress Joint Economic Committee, Washington, D. C., 1959. Nancy Nimitz also discussed this issue. See RM 2326, *Soviet Statistics on Meat and Milk Output: A Note on Their Comparability Over Time*, Rand Corporation, February, 1959.

[22] Z. G. Tresorukova, *Tovarnaya produktsiya sel'skogo khozyaystva*, Moscow, 1974, p. 103.

Production data used in the CIA index for most commodities are the official Soviet gross output figures, with some surrogates. In the case of vegetables, the USSR publishes only a single figure for total output of vegetables. Production of individual types of vegetables must be estimated by applying the percentage distribution of state vegetable procurements to the figure for total output. For sugarbeets, tobacco, makhorka, and tea, official procurement statistics provide a reasonably reliable measure of net output. We assume home consumption of these products to be a very small share of total output.

Although scattered statistics on the use of agricultural commodities have become available, the CIA index must incorporate a number of estimates of seed, feed, and waste in order to have continuous series. Seed estimates are based on officially "normed" seeding rates which may well differ from the true rates. Statistics on waste of agricultural commodities are especially scarce.[24] Ideally an index measuring agricultural output should incorporate waste estimates for grain, sunflower seed, potatoes, fruits, vegetables, and eggs. Although the Soviet press often reports examples of high loss rates for these commodities, the data are so incomplete that the index only deducts waste from production of grain and sunflower seed. Output of other commodities is therefore overstated. However, to the extent that the share of gross output wasted remains roughly the same over time, the failure to make waste adjustments will not affect trends.

Estimates of agricultural commodities fed to livestock also suffer from lack of data. The CIA index deducts from gross output estimates of the grain, potatoes, vegetables, and whole milk used for feed. The release to a USDA feed-livestock delegation to the USSR in 1971 of data on quantities of concentrates by type fed to livestock simplified the task of estimating grain fed.[25] Other products fed, however, must be estimated using commodity balances that attempt to reconcile output statistics with estimates of utilization. For potatoes, however, statistics on utilization are often inconsistent so that a satisfactory independent balance cannot be constructed. For example, for some years, the sum of estimated uses of potatoes for seed, feed, and industrial purposes exceeds total production as reported in statistical handbooks. (See appendix C.)

B. Accuracy

The accuracy of Soviet agricultural statistics has been debated by Western scholars for decades.[26] Inaccuracy is believed to result in part from reporting errors and in part from deliberate falsification. Despite the extensive writing on the shortcomings of Soviet agricultural statistics, the evidence is still ambiguous concerning the degree of accuracy of published official series.

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[23] *Selkhoz 1971*, p. 685; A. M. Bryanskiy, *Statistika zhivotnovodstva*, Moscow, 1956, p. 122; V. Starovskiy, *Vest stat*, no. 4, 1961, p. 105.

[24] Waste is broadly defined to include extraneous matter, damaged output, and losses in handling as well as excess moisture (that is, moisture above a standard level). Waste therefore can include usable product. Broken kernels, for example, in grain would be classified as waste, but would also be usable.

[25] The data were published in USDA, ERS Foreign 355, *Livestock-Feed Balances for the USSR*, (undated). Grain is the major component (roughly 85 percent) of concentrated feed fed in the USSR. Concentrates are low in fiber and high in total digestible nutrients. Aside from grain, concentrates include milling byproducts, oilseed meal, and alfalfa meal. Part of the grain is fed as a component of mixed feed, while the remainder is fed "straight."

[26] A complete review of the debate is beyond the scope of this paper. The most important sources of the last 40 years begin with Naum Jasny's work in the 1940s, and continue with writings by Kahan, Volin, and Richter in the 1960s. Finally, in 1972, a volume dealing with Soviet economic statistics was published containing three chapters on agricultural statistics. See Naum Jasny, *The Socialized Agriculture of the USSR*, Stanford University Press, Stanford, California, 1949; Naum Jasny, "Interpreting Soviet Statistics," *Soviet Survey*, October-December, 1958, p. 9.; Naum Jasny, "Some Thoughts on Soviet Statistics: An Evaluation," *International Affairs*, no. 1, 1959, p. 53.; Lazar Volin, "Agricultural Statistics in Soviet Russia," *The American Statistician*, April-May and June-July issues, 1953.; Luba O. Richter, "Some Remarks on Soviet Agricultural Statistics," *The American Statistician*, June, 1961; Arcadius Kahan, "Soviet Statistics of Agricultural Output," *Soviet Agricultural and Peasant Affairs* (Roy Laird, ed.), University of Kansas Press, Lawrence, Kansas, 1963.; Luba O. Richter, "Commentary" (on Arcadius Kahan's article), p. 165.; V.G. Treml and J.P. Hardt, eds., *Soviet Economic Statistics*, Duke University Press, Durham, N.C., 1972. See the chapters by Philip M. Raup, Eberhard Schinke, and Karl-Eugen Wadekin, all dealing with the validity of Soviet agricultural statistics.

Western scholars generally agree, however, that inaccuracy varies widely over time and affects some statistical series more than others. Political pressure in the Stalin and Khrushchev eras led to falsification of output data. The expansion and improvement in the statistical reporting system that began in the early 1960s may have resulted in more accurate data in recent years. Even today, however, data for politically sensitive commodities such as grain are subject to more manipulation than data for less sensitive products. The prevailing Western opinion still is that reasonably accurate results are obtained using Soviet agricultural statistics if necessary adjustments and cross-checks of the data are made and if the supplied definitions are carefully read.[27]

Soviet writers often paint a more dismal picture of the reliability of their official statistics. Khrushchev stated that "figures for average yield (of grain) which you read in the press these days reflect wishful thinking rather than reality."[28] He also said "unless we put things in order, our plans will be fulfilled statistically, but we will still be short of food."[29] More recently a Soviet emigre characterized the manipulation of Soviet agricultural statistics as follows. "Soviet hens lay a certain percentage more eggs each year but with one biological peculiarity. The annual increase in egg laying begins only with the advent to power of the current rulers."[30]

While we cannot pinpoint the degree of unreliability in Soviet statistics, we can identify those statistical series that are most unreliable. The larger the share of output that originates in the private sector, for example, the more error is likely to occur. Private sector output is estimated by the Central Statistical Administration from a sample survey of collective farm families. Data are collected by schedule takers who visit each family not less than two times a month. Efforts are made to choose "representative" families, but the survey embraces only 1.5 to 2 percent of collective farm families. The following tabulation shows the percentage of gross output of major products produced by the private sector in 1979:

Grain	1.0	Potatoes	59.0
Cotton	0	Meat	30.0
Sugarbeets	0	Milk	29.0
Sunflower seed	2.0	Eggs	33.0
Vegetables	31.0	Wool	19.0

The figures suggest that the livestock sector is more affected than the crop sector by inaccuracies in estimates of private sector production. One Western writer on Soviet statistics concludes that the degree of error in these statistics is difficult to assess without more detail on the sample coverage. We can only be aware that such error exists.[31]

Socialized sector output statistics are derived from the annual reports of farms. These reports are based on an elaborate accounting system that is said to incorporate cross-checks to prevent error and falsification. Such a system should provide accurate statistics, but failure to follow prescribed practice and shortages of qualified statisticians and bookkeepers introduce an element of error at the initial stage. Moreover, farms have no incentive to correct for waste because reductions in gross output entail more difficulty in plan fulfillment and higher unit costs, whereas success requires high output and low unit cost.

For example, farms frequently fail to weigh their output accurately. Truck scales are in short supply and often faulty. Grain output is thus often estimated according to the fullness of the combine hopper, although it is supposed to be weighed prior to recording in output accounts. For potatoes and vegetables, output estimates are haphazard. Potatoes are frequently stored in the fields in pits or piles. The weight of output is determined according to the dimensions of the pile and the actual weight of one cubic meter of output. Requirements for weighing vegetables are relaxed at the peak of the harvest, and the quantity of vegetables is measured according to the number of units, bunches, or basketsfull brought from the field. Later, these are converted to kilograms according to the actual weight of a sample of the produce. According to one Soviet source, on vegetable farms where harvested area is large and hundreds of workers are involved, it is impossible to carry out even this measuring of vegetable output. The first accurate weighing is done only when the vegetables are sold.

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[27] Karl-Eugen Wadekin, "Soviet Agricultural Statistics: Summary and Assessment," in Treml and Hardt, p. 282.

[28] N. S. Khrushchev, *Khrushchev Remembers: The Last Testament*, (Strobe Talbott, ed.), Little, Brown and Co., Boston, Toronto, 1974, p. 131.

[29] Quoted from the New York Times report on January 15, 1961 (p. 28) of the 1961 Party Plenum.

[30] Lev Navrozov, "What the CIA Knows About Russia," *Commentary*, September, 1978, p. 51.

[31] Eberhard Schinke, "Soviet Agricultural Statistics," in Treml and Hardt, p. 244.

Deliberate falsification of output statistics is another source of inaccuracy that is very difficult to evaluate. There is ample evidence from Soviet sources suggesting that in the Khrushchev era ambitious agricultural campaigns and unrealistic output targets led many officials to inflate output statistics. Soviet officials claim that falsification is less now than before the 1961 decree that imposed prison sentences for falsification of data. Although we tend to believe that instances of deliberate falsification are probably less frequent now than in earlier periods, references to statistical malpractice occur periodically. Farms still have incentives to understate one year's production in order to reduce plan obligations in the following year or to obtain permission to curtail production of an unprofitable commodity. In 1978 a resolution of the Georgian Central Committee cited frequent cases of padding, underreporting, and other gross "distortions" in overall statistical reporting in the republic. Over 3,800 statistical checks were conducted by state statistical organizations; almost one third of the records inspected were found to have some type of deliberate misrepresentation. The First Secretary of the Tadzhik SSR recently criticized state and party organs in the republic for insufficient implementation of the 1961 resolution against fraudulent reporting. He cited false reporting of statistics on sown area, production, sales, number of cattle, animal disease rates, and other statistics.

Involvement of several ministries in statistics on marketed commodities may offer some constraints to falsification of those data. Present accounting practice particularly provides opportunities for false reporting of commodities which remain on the farm after sales or are produced solely for farm use, such as animal feed. In 1979, both the Georgian Central Committee and the First Secretary of Azerbaydzhan publicly denounced falsely inflated reports of fodder production in their republics. Milk production can be inflated by claiming that nonexistent output was fed to livestock. Farms have been known to purchase output from individuals or on collective farm markets and to credit the amount to farm production.

Error in and falsification of agricultural statistics probably vary greatly among regions and from year to year. Because references to the subject are scarce and the extent to which it occurs cannot be determined, the impact on output statistics cannot be quantified. We can only conclude that falsification probably causes some upward bias in the level of output figures and that the degree of bias may not be the same for every year. As a result, the net effect over time, in the context of a trend value, remains unclear.

C. Lack of Consistency Over Time

Since 1950 a number of Soviet agricultural statistics series have undergone definitional changes without corresponding adjustments to published data. Between 1939 and 1953, Soviet grain crops were measured in terms of so-called "biological" output per hectare. These were estimates based on samples of the crop as the ripe grain stood in the field and did not take into account losses of grain prior to and during

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M. Z. Pizengol'ts, *Bukhgalterskiy uchet v sel'skom khozyaystve*, Moscow, 1974, pp. 111-112.

Uchet i finansy v kolkhozakh i sovkhozakh, no. 10, 1979, p. 16.

Fletcher Pope, *Collecting Agricultural Statistics in the Soviet Union*, U.S. Department of Agriculture, Foreign Agricultural Report No. 112, November 1975, p. 15.

Zarya vostoka, 4 June 1978, p. 1. Not all of the instances cited refer to agricultural reporting.

Kommunist Tadzhikistana, 27 March 1979, p. 2.

Zarya vostoka, 1 June 1979, p. 1 and *Bakinskiy rabochiy*, 25 July 1979, p. 1.

Even procurement statistics have been doctored, although these have always been considered more reliable than output statistics (J.W. Willett, "The Recent Record in Agricultural Production," *Dimensions of Soviet Economic Power*, US Congress, Joint Economic Committee, Washington, D.C., 1962, pp. 96-98). Instances of collusion among farm officials, state procurement agents, and inspection officials have been reported (*Zakupki sel'skokhozyaystvennykh produktov*, no. 2, 1978). Farms, for example, have been credited with fictitious deliveries of agricultural products to procurement agencies. *Zakupki sel'skokhozyaystvennykh produktov*, no. 10, 1975, reports such fraudulent transactions in the Ukraine, Lithuania, and Belorussia.

harvesting. The "bunker weight" yield of the crop (that is, the grain as it weighed directly after combining before preliminary cleaning and drying and before handling and transportation losses occur), is usually below the biological yield. Similarly, the clean, dry, standard-weight portion of the crop is usually less than the bunker weight. In 1954, the bunker weight concept was adopted for official grain output statistics. However, bunker weight statistics for the 1955-58 period and output data for 1950-54 restated in bunker weight were not published until December 1958. In addition, in 1958 the Central Statistical Administration published instructions for estimating the grain crop. These instructions were never publicly disseminated, but are believed to represent an alteration in the bunker weight measuring system adopted only four years earlier.

Published yield statistics suggest that bunker weight grain output statistics before and after 1958 are inconsistent. During 1958-62, the average yield of grain is reported to have increased to 10.9 centners per hectare — an increase in average annual yields of 27 percent over 1954-57. Although grain output in pre-1958 statistics probably was understated by official manipulation of the data, the jump in yields that occurred in 1958 appears to be at least partly due to a change in statistical methodology that was never explained.

To test the consistency of official grain statistics before and after 1958, official production data for 1950-62 were compared with output data estimated from weather data, seeding and harvesting reports, procurement data, statements by Soviet officials, and the like. The comparison in table 4 of estimated and actual crops in 1950-1962 shows that for 1950-54, estimated production is equal to or larger than officially reported output. After 1958, however, official production exceeds our estimates by a large margin. The comparison suggests that either 1950-54 grain output statistics are deliberately understated or that statistics following 1958 are exaggerated.

Our grain balance calculations, which begin in detail in 1960, indicate that grain output as shown in official statistics for 1960-62 are reasonably consistent with the sum of grain uses estimated on a bunker weight basis. We tend to accept the hypothesis, therefore, that grain statistics for 1950-54 (bunker weight) are deliberately understated. We attempt to compensate for this understatement by making no deduction from official data for waste and losses in 1950-54. For other years a weather-related discount is used to eliminate excess moisture and waste. These estimates and a full discussion of grain waste are in section V, below.

The treatment of corn in official Soviet grain statistics has also changed. Before 1955, immature corn (in the milky-waxy stage of ripeness) was included in statistics for grain. Between 1955 and 1962, Soviet statistical handbooks reported totals for grain output with and without immature corn. Since then, farms have accounted separately for fully ripe corn and corn in the milky-waxy stage of ripeness. Even so, corn statistics are still not entirely consistent with the bunker weight measure for other grain crops. Ripe corn is converted to grain according to the average yield of grain from the cobs as measured by threshing of samples and is expressed in terms of a standard

Soviet statistical handbooks use the term "gross harvest" (*valovoi sbor*). Statistical handbooks prior to 1963 contained the phrase "barn yield" (*ambarnyi urozhai*) in parenthesis, but later issues omit the reference to barn yield.

The USSR never published details of the conversion of biological yield data to bunker weight for pre-1954 data. One Soviet publication stated that annual reports of farms were the basis for recalculating yields. Farms had collected bunker weight data for 1950-54 and earlier. (N. N. Zhivilin, *Sovremennaya organizatsiya statistiki zemledeliya*, Moscow, 1960, p. 102.)

For a complete discussion of the 1958 change in grain statistics, see CIA/RR ER 64-33, *Production of Grain in the USSR*, October, 1964, p. 19-22.

Ibid., p. 15-17.

The differences in 1955 and 1957 are small but the change in sign from negative to positive indicates some change in reporting or a sudden improvement in agrotechnology. The comparatively large discrepancy in 1956 is attributed to excessive postharvest losses resulting from inadequate transportation and storage facilities in the new lands areas to handle the bumper crop produced there.

CIA/A (ER) 75-68 *The Soviet Grain Balance, 1960-73* September 1975, p. 24.

To make this calculation total corn output was stated in terms of dry corn equivalent. From this total, output of fully ripe corn was subtracted. The remainder was the dry corn equivalent of immature corn. This figure was subtracted from total grain output to derive total output excluding immature corn. The grain equivalent of immature corn was apparently not a component of total grain output prior to 1954 (*Narkhoz, 1962* p. 268).

Table 4

Comparison of Official and Estimated Grain Output, 1950-62 [a]

	Grain Production [b] (million metric tons)		Excess of Officially Reported Output Over Estimated Production (percent)
	Official Data	Estimated	
1950	81	85	4.7
1951	79	80	1.2
1952	92	92	0.0
1953	82	83	1.2
1954	86	87	1.1
1955	107	103	3.9
1956	128	115	11.3
1957	105	100	5.0
1958	141	125	12.8
1959	126	100	26.0
1960	134	100	34.0
1961	138	115	20.0
1962	148	115	28.7

[a] CIA/RR ER 64-33, *Production of Grain in the USSR*, October 1964, p. 16.

[b] These statistics include the grain equivalent of corn harvested in an immature stage which is no longer included in Soviet statistics on grain production.

moisture content of 22 percent.[44] Moisture content of other bunker weight grains varies widely, depending on harvesting conditions as well as degree of ripeness. No aggregated data on moisture content at the time of harvest are published.

Meat statistics have become more inclusive over time. Between the 1920s and 1940s the definition of meat was expanded from beef, veal, pork, and mutton to include poultry, rabbit, and fat from all types of animals. By 1954, edible offal had been added to the definition of meat.[45] Approximately in 1956, the definition of meat was expanded again to include horse, camel, and other minor meats.[46] Published data are available from 1950 covering the broader definition of output.

In 1965, the USSR revised its method of reporting the size of livestock herds. While this did not result in definitional changes, it may have caused statistics for subsequent years to be less accurate than earlier ones. Prior to 1965, the annual census of livestock on 1 January was taken by enumerators who visited socialized farms during the first weeks of January. In 1965 the livestock census was discontinued. Herd numbers for 1 January are now derived from the monthly and quarterly livestock reports submitted by these farms to the Central Statistical Administration. The change in procedure was ascribed to the improved quality of farm bookkeeping and to the increasing share of livestock in the socialized sector. Numbers of privately owned livestock on 1 January are taken from accounting records of rural councils.[47] As in the pre-1965 period, local statistical offices spotcheck private sector livestock reporting by surveying 10 to 15 percent of households with privately owned holdings.

D. Comparability with Western Statistics

Soviet agricultural output statistics are often not directly comparable with those used to measure agricultural output in the West. Coverage is frequently broader and the quality of the Soviet product is often lower than that of Western counterparts. This lack of comparability clearly affects comparisons of levels of output and can complicate comparisons of growth in agricultural output over time. International comparisons overstate the relative position of the USSR unless adjustments such as those using ruble-dollar conversion ratios are made to compensate for the lower quality of Soviet output.

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[44] F. G. Doigushevskiy and A. G. Khristich, *Sel'skokhozyaystvennaya statistika s osnovami ekonomicheskoy statistiki*, Moscow, 1976, p. 94. Reporting corn in a standard 22 percent moisture content is similar to a bunker weight concept inasmuch as 22 percent is the upper limit of moisture at which husked ears can be stored in slatted cribs where they will dry by spring to the 14-15 percent moisture needed for safe warm-weather storage.

[45] Offal is defined in footnote 10.

[46] For a complete discussion of these statistical revisions, see Nancy Nimitz, *Soviet Statistics of Meat and Milk Output: A Note on Their Comparability Over Time*, RM 2326, the Rand Corp., February, 1959.

[47] Rural councils (*soviets*) are the local administrative agencies of the central government. Certain agricultural matters are included in their administrative responsibility for local trade and industry.

Lack of quality comparability probably poses less of a problem for comparisons of growth of agricultural output than it does for comparisons of levels of output. Growth comparisons are affected, however, if noncomparable Western and Soviet data are used to construct price weights and component indexes of overall indexes of farm output. If relative prices for agricultural products in both countries do not reflect production tradeoffs (marginal rates of transformation), then the validity of growth comparisons is reduced. For example, farm-gate prices in the US index of agricultural production probably measure marginal rates of transformation reasonably well; Soviet prices, however, are set by the government with little consideration of actual costs. In a US-USSR comparison, however, the effect of these deficiencies in Soviet prices on growth comparisons is small. Of course, relative prices can shift over time with the result that growth comparisons would vary depending on the base year chosen for indexes of output.

The relatively broader coverage of Soviet agricultural statistics on meat production is another example affecting weights and therefore comparisons of growth. Soviet statistics include meat from rabbits, horses, deer, camels, and so on, which few Western countries include. In a US-USSR comparison Soviet meat output is not seriously overstated because these quantities are small in the USSR and even smaller in the United States. A more serious source of difference in the weights is the inclusion of edible offal and slaughter fat in Soviet meat production. The Soviet definition of slaughter weight includes internal and subcutaneous fat which, for example, can add 10 percent or more to the weight of a beef carcass. Without some adjustment, the structure of Soviet agricultural output would give meat production too heavy a weight relative to the weight of meat in the US output. For comparisons therefore, meat output in both countries is measured on a liveweight basis to improve comparability of definitions.

Growth comparisons are also affected by changes in product quality over time. An index based on physical production understates real growth in output if quality has improved simultaneously. International comparisons of growth in agricultural output assume constant quality although the assumption may be unwarranted. Evidence suggests some improvement in the quality of Soviet livestock products, especially beef, between 1950 and 1978. Soviet meat animals have more meat on the bone than formerly, and the quality of milk and eggs has improved somewhat. Furthermore, the oil content of sunflower seed has risen. In theory, indexes of output of these commodities could be adjusted for quality to improve growth comparisons, although such an adjustment would be difficult to construct in practice. In the case of US-USSR comparisons of growth over time, the bias introduced by shifting quality probably is small because improvement in quality of US products, particularly pork, has also occurred.

V. Deductions for Waste.

A. The Nature of the Problem

Soviet gross output statistics for many agricultural commodities are inflated by waste. Grain output statistics, for example, measure the harvest prior to any cleaning and drying. In the USSR, grain harvesting procedures and weather patterns tend to result in unusual amounts of extraneous matter being included in gross output. Excess moisture, damaged kernels,

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US-USSR comparisons of agricultural output are discussed in Douglas Whitehouse and Joseph F. Havelka, "Comparison of Farm Output in the US and the USSR, 1950-1971," *Soviet Economic Prospects for the Seventies*, Joint Economic Committee, US Congress, Washington, D.C., 1973, p. 340.

To test the effect on the index of deficiencies in Soviet prices, we substituted cost of production figures in 1970 (*sebestoimost'* from *Sel'khoz 1971*) for 1970 average realized prices. The substitution slowed growth in crop production by one tenth of one percent. Livestock output growth accelerated by two tenths of one percent for the 1951-78 period as a whole. While official Soviet cost data have major deficiencies (for example, a return on land and interest charges on capital are not included) they are probably closer to marginal rates of transformation than average realized prices.

Sel'skokhozyaistvennaya entsiklopediya, Vol. I, Moscow, 1969, p. 693.

See footnote 24.

and extraneous matter not found in large quantity in harvested grain in most countries are counted as grain output in the USSR. Other commodities affected are potatoes, sugarbeets, fruits and vegetables, sunflower seed, and eggs.[14] Although waste included in Soviet statistics is an important difference between US and Soviet agricultural statistics, deducting waste is not merely a matter of improving comparability. Waste must be deducted from gross output because it is not included in that part of output available for sale and home consumption. Furthermore, procurement prices apply to output on a "standard" basis, that is, net of excess moisture and trash. The CIA index deducts only for waste and losses in grain and sunflower seed. Potatoes, fruits, vegetables, and eggs are not discounted because no consistent methodology or data could be developed to remove waste from these commodities although Soviet sources claim that losses of these commodities are significant. In the case of sugarbeets, we use procurements as a surrogate for output data. Procurement statistics are expressed in standard weight which, by Soviet definition, excludes waste.[15] Nevertheless, Soviet sources suggest that losses of potatoes, vegetables, fruits, and sugarbeets are significant.

Losses of agricultural output occur at several stages in the production and marketing process. Not all are relevant for measuring net output. Harvesting losses consist of output left in the field at harvest time or lost in transporting the harvested output to the point of weighing and recording. These amounts are never recorded as gross output and therefore need not be deducted; they represent losses of potential output rather than actual output.

The second stage of losses, which should be deducted from reported output, is that output rendered either totally unusable or unusable in part by weather conditions (rain, frost, snow), by insect or disease damage, or by damage in harvesting. Combine harvesting of potatoes, for example, reportedly damages 30 to 40 percent of output.[16] Only part of the damaged product would be completely unusable; much would be usable as feed. Reported output should also be reduced by the amount of extraneous matter (weeds, stones, dirt, and so on) that is mixed with the harvested crop at the time of weighing and recording. Transportation losses incurred in moving the product from the point of weighing and recording to initial storage should also be deducted.

Storage losses, primarily spoilage or pest damage in storage facilities, are not relevant for purposes of calculating net output. Once the crop has been harvested, cleaned, and initially stored, it is theoretically available for use on the farm, for processing, or for export. Subsequent losses in storage and shipping need not be deducted, although these are occasionally very large. Losses of potatoes, for example, in storage after harvesting have been estimated at 10 to 25 percent.[17]

B. Calculation of Waste in Sunflower Seed and Grain

The CIA index of Soviet agricultural production makes an 8 percent discount for sunflower seed waste and a fluctuating discount for grain waste. Our estimate of sunflower seed waste is based on a Soviet source that cited the results of calculations for 1958. According to the author, the yield of sunflower seed after cleaning was 8 to 8.5 percent below the gross crop.[18] No subsequent comparable data have been found.[19]

The allowance for grain waste is based on the premise that the level of waste fluctuates primarily according to the amount of precipitation during the two-month period immediately preceding and during harvest.[60] Wet harvesting conditions tend to raise moisture content of harvested grain to levels above internationally accepted standards. Excess moisture inflates bunker weight output statistics and increases chances of subsequent losses from spoilage. Although Soviet postharvest cleaning and drying is intended to restore wet grain to full value, the wetter the harvesting conditions, the more difficult this becomes. Mishandled wet grain may be grossly damaged or entirely spoiled for one or more of its intended uses. For the fall-sown winter grains, the months are June and July, and for spring grain, August and September. For each year in the index, the periods are categorized by degree of "wetness": very dry, dry, normal, wet, and very wet according to the average number of millimeters of rainfall received, as follows:[61]

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[14] Soviet agricultural periodicals and monographs frequently refer to losses of these commodities. See for example, *Ek selkhoz*, no 4, 1979, pp 60-66; *Ek selkhoz*, no 1, 1978, p 32; *Sel'skaya zhizn*, 13 September 1972, p 2; *Plan khoz*, no 7, 1978, pp 44-55; and N M Bashkirev, *Organizatsiya proizvodstva, zagotovok i povysheniye kachestva yaits v ptitsevodcheskikh ob'yedineniyakh*, Moscow, 1979.

[15] *Selkhoz 1971*, p 682.

[16] *Ibid.*

[17] *Ek selkhoz*, no 11, 1979, p 38.

[18] *Ek selkhoz*, no 6, 1959, p 32.

[19] In the only other reference found, the author claimed that the yield after cleaning was 6 percent below the gross harvest in 1970 and 1971. We have not modified our discount because the derivation of these percentages is unclear. The tabulation in which they appear includes production statistics that agree with official data. Sales and procurement statistics in the tabulation differ from those published elsewhere. Tresorukova, *op. cit.*, p. 53.

	Spring Wheat	Winter Wheat
Very wet	Over 45.8	Over 76.3
Wet	40.5 - 45.7	65.3 - 76.2
Normal	35.3 - 40.4	53.8 - 65.2
Dry	29.6 - 35.2	42.3 - 53.7
Very dry	Below 29.5	Below 42.2

Each moisture category, in turn, is assigned a percentage grain discount; a discount of 11 percent is adopted for years of normal precipitation.[62] We arbitrarily raise this figure to 13 percent for wet years and to 15 percent for very wet years. In the other direction, 11 percent is lowered to 9 percent for dry years and to 7 percent for very dry conditions. The discounts for winter and spring grains are weighted together using 30 percent for winter grains and 70 percent for spring grains. These weights reflect the approximate percentage of spring and winter grains in total output.[63]

For 1950-59, weather related discounts must take into account the fact that 1950-54 official output statistics probably understate the actual crop. For 1950-54, therefore, the weather-related discount is not applied.[64] For 1955-59, the necessary monthly precipitation data are not available. For this period, the 1960 weather-related discount is moved back using an index of discounts proposed by Arcadius Kahan. This results in discounts of official statistics that resemble the discounts implied by the comparisons in Table 4 of official and estimated output statistics. The index of discounts is also consistent with the belief of another writer that pre-1954 crop statistics are understated and that the years 1954-57 require smaller discounts than subsequent years. As Table 5 shows, with the exception of 1956, discounts derived in this manner are smaller for 1954-57 than for most other years in the series.

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[60] The theory that variation from average precipitation during harvesting is the main determinant of moisture and foreign matter in harvested grain was set forth in U.S. Department of Agriculture, ERS, *Methodology for Estimating Variations in Soviet Bunker Weight Grain Crops*, 1975, (unpublished). Although the grain discount also includes extraneous matter and unripe and damaged kernels, no systematic separate methodology has been devised to measure them. Excess moisture is believed to be the largest and most variable component of waste with the greatest impact on trends in output. Amounts of damaged kernels also fluctuate widely, but they probably have a smaller impact on trends.

[61] Precipitation data are compiled by the U.S. Air Force. Mean monthly precipitation data by oblast for each two-month period are weighted by the respective sown area of spring and winter wheat.

[62] The average discount of 11 percent was derived indirectly from a rough calculation based on quality (feed unit or nutritive value) of concentrates fed on state and collective farms. (See A (ER) 75-68, pp. 13-15.) Because of the way the official series on concentrated feed is constructed, much of the exaggeration in Soviet grain production statistics resulting from excessive moisture, dirt, damaged kernels, weed seeds, and the like, (waste), appears in the data on quantities of concentrates fed. Grain makes up roughly 85 percent of the total tonnage of concentrates fed (see *ibid.*, p. 33). Our hypothesis is based on the difference between a) the average feed unit value of concentrates fed as derived from published Soviet statistics (*Selkhoz 1971*, pp. 332-333) and b) an average feed unit value derived from the quantities of grain by type available for feed (from the grain balances) over the same years, 1961-70 pp. 25-29). We assume the assortment of grain actually fed is the same as that of estimated grain available for feed. When these tonnage figures are converted to feed units using standard Soviet norms (see G. A. Kulik, *Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, p. 538), the resulting average feed unit value is substantially higher than the average derived from the published series. The discrepancy — which we attribute to waste including higher moisture — ranged from 12 percent to 21 percent over the 10-year period for which the data were available. Because we assume the waste level to be uniform for the entire crop on the supply side, the overall discount rate must be smaller. In crop year 1967/68, for example, the estimated waste in feed is 20 percent. The tonnage represents about 8 percent of grain produced in that year. Quantities of waste as shares of output ranged from 4.3 to 11.6 percent over the 10-year period; the average was 8 percent which we adopted as an average discount. To this we add a 3-percent allowance for losses in transportation and handling (A (ER) 75-68, p. 18). Although in theory subsequent losses of grain need not be applied for purposes of estimating net output, they are included in order to be consistent with our estimates of grain balances and grain fed.

[63] We recognize that equating these moisture categories with specific waste levels implies a more precise and consistent relationship between precipitation and grain waste than actually exists in fact. To date, however, this is the most satisfactory, consistent methodology developed to measure fluctuations in grain waste.

[64] Despite the presumed understatement in official Soviet grain output statistics in those years, excess moisture and waste existed. See, for example, the statement that waste, shrinkage in drying, and postharvest losses amounted to 5.1 percent of 1953 gross grain output in kolkhozes. (A.I. Gozulov, *Statistika sel'skogo khozyaystva*, Moscow, 1959, p. 450.) See also Nancy Nimitz, RM-4127-PR, *Soviet Government Grain Procurements, Dispositions, and Stocks, 1940, 1945-63*, Rand Corporation, November, 1964, p. 4. We omit the weather-related discount for these years in our estimates of net grain output only to compensate for the understatement in official statistics. We do not imply that these losses did not exist or that farm statistical reports did not contain bunker weight output data.

Kahan uses a 6 percent discount for 1954, 7 percent for 1955 and 1957, and 10 percent for 1956, 1958, and 1959. These discounts suggest drier conditions in 1954, 1955, and 1957 than in 1956, 1958, and 1959, and are supported by a recent Soviet article on comparative precipitation levels in the major grain areas of the USSR. The article lists the incidence of dry years in five major grain areas: European Russia, Ukraine, the "Volga Valley," Western Siberia and Altay kray, and Northern and Central Kazakhstan. During the 1950s, over 80 percent of area sown to grain was in the European USSR, the Ukraine, and parts of the Volga Valley. In all three major regions, 1954 and 1957 are listed as "dry years"; 1955 is listed as dry in the Volga Valley. On the other hand, 1956, 1958, and 1959 are listed as wet in two of the three major grain areas of the 1950s, indicating the need for larger waste allowances.

The second factor in the grain discount is the adjustment for crop size. Grain crops that are larger than average strain Soviet capacity to harvest, transport, clean, and dry the grain, especially when a large crop coincides with rainy weather at harvest time. We assume waste is larger under these conditions than when small harvests and dry weather coincide, as in 1975. To adjust the discount for crop size, we derive the percentage difference between the actual crop as reported in Soviet sources, and the crop that would have resulted under average conditions.

We use half of this percentage difference to adjust the weather-related discount. In this manner we account for that portion of the grain crop lost because of inadequate harvesting and processing capacity. In 1973, for example 2.0 percent is added to the weather-related discount to account for these losses. In 1975, on the other hand, the crop was small enough to be handled by existing capacity. In addition, the weather was dry. Thus, 1.2 percent is subtracted from the weather-related discount to account for minimum losses in that year. Table 5 shows the composition of the grain discount.

VI. Deductions for Seed and Livestock Feed

To measure agricultural output available for sale and home consumption, gross agricultural production should be reduced by the quantities of output used for seeding crops, feeding livestock, and for hatching poultry. The CIA index makes deductions for grain, potatoes, vegetables, and whole milk fed to livestock, eggs used for hatching, and quantities of grain and potatoes used for seed. Sunflower seed used for seed is not deducted because, according to seed norms, less than 1 percent of the crop is used for seed. Appendix C reports the methodological details and source references for these estimates. In the following discussion of seed and feed use, we are concerned with the implications of the estimates and their reliability.

The trends in feed and seed use as a share of gross output are shown in table 6. Annual averages are used instead of data for individual years to smooth the year-to-year fluctuations in harvest size. The table shows seed use declining as a share of gross crop

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See Kahan's article "Soviet Statistics of Agricultural Output," *Soviet Agricultural and Peasant Affairs* (Roy Laird, ed.) University of Kansas Press, Lawrence, Kansas, 1963.

Luba O. Richter, "Commentary" (on Arcadius Kahan's article), *Ibid.* p. 165.

Yu. I. Rauner, *Izvestiia akademii nauk SSSR*, no. 6, 1976, pp. 37-54.

Grain crops that would have resulted under average conditions (trend) are derived by first subtracting the moisture discount from gross grain output and dividing by sown area to derive "clean" yields. These yield figures are regressed against time to derive clean yields that would have been obtained under average conditions. Clean yields are multiplied by sown area and by 1.11 to derive an "average" gross harvest with a normal waste content of 11 percent.

Table 5 Percent

USSR: Estimated Waste and Losses in the Gross Grain Harvest

	Weather Related	Crop Size Adjustment	Total [a]
1950			
1951			
1952			
1953			
1954			
1955	7.7	0.5	8.2
1956	10.8	1.0	11.8
1957	7.6	0.0	7.6
1958	10.1	1.4	11.5
1959	10.2	0.6	10.8
1960	9.8	0.2	10.0
1961	8.4	0.3	8.7
1962	7.6	0.0	7.6
1963	7.6	−1.1	6.5
1964	9.8	0.0	9.8
1965	7.6	−0.7	6.9
1966	8.2	0.5	8.7
1967	10.4	−0.2	10.2
1968	8.2	0.4	8.6
1969	13.0	−0.2	12.8
1970	13.8	1.1	14.9
1971	11.0	0.7	11.7
1972	9.6	0.2	9.4
1973	14.4	2.0	16.4
1974	13.6	0.2	13.8
1975	9.0	−1.2	7.8
1976	13.0	0.7	13.7
1977	15.0	−0.4	14.6
1978	12.2	1.0	13.2
1979	12.4	−0.9	11.5

[a] Total is sum of columns 1 and 2.

output. The same trend is observed if seed is taken as a share of only gross grain and potatoes. The trend implies increased output per unit of seed.[69]

The reverse is true of intrasector use for livestock output. The share of deductions in gross output increases over time, even with hatching eggs removed from the series. This is consistent with our observation of increased use of grain for feed in recent years without proportionate increases in livestock output.[70] The increasing share of crop output used for feed also reflects the shift toward sale and home consumption of livestock products rather than direct consumption of crops.

A. Grain and Potatoes Used for Seed

Estimating seed use is a relatively straightforward process. Soviet data on sown area are multiplied by seeding rate norms to derive quantities of seed needed for grain and potatoes. We assume that actual seeding rates approximate those norms prescribed by Soviet guidelines for farm managers. The total includes area sown to grain in the fall but subsequently damaged by winterkill or used for winter and early spring grazing. The estimate also allows for corn area harvested as forage (silage, green feed, or dry fodder). Quantities required for fall seeding of grain and for spring seeding of grain and potatoes are deducted from gross output of grain and potatoes in the given year to derive net output. Gross grain output is first reduced by the grain discount to eliminate waste. No allowance is made for seeding of other crops.

[69] Because the evidence indicates little or no reduction in seeding rates per hectare, nearly all the growth in output per unit of seed results from rising yields per hectare. Average overall grain yields for the three year period 1976-78 were 54 percent above the average yield in 1950-72. For the most part, this reflects a substantial increase in use of fertilizer on grain crops. For example, measured in standard units, the quantity of fertilizer used on grain increased from 2.2 million tons in 1960 to 14.6 million tons in 1970. (See ER 77-10557, *The Impact of Fertilizer on Soviet Grain Output, 1960-80*, November 1977, p. 19.)

[70] Not only has the absolute quantity of grain fed been increasing, but since 1976, the share of feed units provided by concentrates, largely grain, has been increasing. For the most part, this trend reflects the failure of non-grain feed crops (silage, hay, etc.) to increase at the same rate. (See ER 79-10057, *USSR: Long-Term Outlook for Grain Imports*, January 1979, p. 19.) This trend was intensified during 1978/79 when the USSR was severely affected by weather conditions that forced a further increase in the share of grain being fed.

Table 6

Million 1970 rubles

Intrasector Use of Agricultural Output, Annual Averages, Selected Years

	1950-52	1959-61	1964-66	1969-71	1977-79
Seed					
Grain	2139.7	2478.2	2817.7	2624.4	2738.6
Potatoes	1818.7	1991.6	1841.4	1803.7	1525.8
Total	**3958.4**	**4469.7**	**4659.1**	**4428.1**	**4264.4**
Seed as a share of gross crop output	17.0	13.7	12.1	10.1	8.7
Feed and hatching eggs					
Grain	1298.8	3400.0	3852.2	6071.6	9308.6
Potatoes	1350.3	2370.9	2251.2	2467.5	2436.0
Vegetables	25.3	145.7	186.8	117.2	193.2
Milk	908.1	1574.5	1679.1	2221.3	2234.4
Total feed	**3582.6**	**7491.1**	**7969.3**	**10877.6**	**14172.2**
Hatching eggs	35.3	108.7	94.2	175.0	324.4
Total intrasector use	**3617.9**	**7599.8**	**8063.5**	**11052.6**	**14496.6**
Intrasector use as a share of gross livestock output	16.8	18.8	18.2	20.3	22.2

Shortcomings of the seed estimates center on the seeding rates. We use a constant seeding rate for the entire 1950-79 period whereas the actual rate probably has changed over time. Evidence indicates, furthermore, that our seeding rates may be too low. One Soviet source claims that 20 centners per hectare of potatoes were seeded during 1962-65 and 25 centners during 1967-69.[71] We estimate potato seeding at 19 centners per hectare for all years. In the case of grain, a Soviet writer claims that seed use averaged 30.8 million tons per year during 1971-75.[72] Our estimates show average seed use of 26 million tons during the period. The grain calculations may understate actual use because the norms refer to 'first-class' seed, which exceeds the quality of much seed grain.[73] As of 1 January 1979, for example, only 71 percent of seed for spring grain and pulse crops met standards for first or second class seed.[74] Presumably, the lower the seed quality the more seed is required for a given area.

B. Estimates of Livestock Feed and Hatching Eggs

We estimate quantities of grain, potatoes, vegetables, and whole milk fed to livestock. We do not estimate quantities of skim milk fed for reasons discussed below. Finally, although some fruit is fed to livestock in the USSR—largely because of marketing problems—we make no estimates of the quantities because of data limitations.[75]

Estimating feed fed to livestock poses many more problems than deriving estimates of seed use. The CIA index includes the value of feed produced and used within agriculture such as hay, corn for silage, feed roots, and pasture feed in the value of livestock output. Although it would be more correct to add their value to crop production and deduct it from livestock output along with other feeds produced in the crop sector, this is a difficult, if not impossible, task. Problems include lack of consistent and complete production data, extensive waste—particularly spoilage—of these products making it impossible to know how much of each would actually be fed, and the difficulty of deriving prices for products that to a large extent are not sold in the USSR. In any case, the index of total net output remains the same whether hay and other forage crops are included in livestock output or in output of the crop sector.

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[71] *Zakupki sel'skokhozyaystvennykh produktov*, no. 3, 1973, p. 18.

[72] *Plan khoz*, no. 3, 1979, p. 38. See also, *Pravda Ukrainy*, 15 July 1979, p. 2, which argues that farms incorrectly increase the norms for seeding, and notes that increasing the norm does not make up for poor soil preparation, poor use of fertilizer, and so on. *Zakupki sel'skozyaystvennykh produktov*, no. 1, 1978, p. 6, implies that during 1971-75, farms sowed from 22 to 37 million tons annually.

[73] First-class seed is seed with no more than 1 percent (by weight) content of broken kernels and admixtures and with viability not less than 95 percent.

[74] *Ibid*.

[75] Statements are limited to "farms every year are forced to send millions of tons of fruit for feed" (*Trud*, 8 August 1967, p. 2); "as is known, the larger the fruit harvest, the bigger the share fed to cattle" (*Plan khoz*, no. 8, 1968, p. 59); and "a goodly share of fruit is fed to livestock" (*Literaturnaya gazeta, no. 1, 1973, p. 10)*.

Grain. Estimates of grain fed to livestock are based on the official Soviet series for concentrated feed fed to livestock. According to the Soviet definition, concentrated feed includes grain, oilseed meals, dehydrated alfalfa or other high quality forage, and grain milling byproducts together with screenings and other elements of usable waste such as damaged kernels from grain cleaning operations. Feeds of animal and synthetic origin are not included. The concentrates series is believed to reflect the excess moisture and waste found in harvested grain, bunker weight.

To derive the grain component of concentrated feed, we subtract oilseed meal, grass meal, and grain milling byproducts from total concentrates. Conceptually, the remainder consists of grain as well as the waste associated with the grain production series.[76] To remove waste elements from grain fed, we allocate 80 percent of the quantity of grain written off in the grain discount (see above) to feed use.[77] In this way, we estimate clean grain for feed that is compatible with the definition of clean grain on the output side. Although this procedure is arbitrary, it is consistent with the apparent low overall quality of Soviet grain used for feed. Estimates of grain fed for 1960 forward fit fairly well into our grain balance calculations.[78] Official data on concentrates fed for the 1950s, however, are not available. Feed can be estimated by assuming that all grain not allocated to seed, food, industrial uses, and stocks is fed or by estimating the quantities of grain required to produce the livestock products and to maintain or increase herds in those years.[79] We chose the second method because grain balance calculations show only small quantities available for livestock feed and stock changes in many years of the 1950s. For several of these years, grain balance residuals are below the apparent amount of grain—along with standard norms of nongrain feeds—required to produce the livestock output obtained in those years. We have not reconciled these inconsistencies except to note that grain fed estimates for the 1950s are less reliable than those for later years. We believe the feed series based on concentrates required to produce the output and to support changes in herds leads to a more reliable measure of the value of net livestock output in the 1950s than does a series based on grain balance residuals.[80]

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[76] The residual *may* include small amounts of nongrain, nonoilseed products which go into the production of mixed feed such as meat, blood, and bone meals, fish meal, and vitamin and mineral supplements as well as ground hay and other materials with low feed energy value. Farms are required to report quantities of mixed feed fed as one of the components of the concentrates group. It is not known if the farm reduces the reported quantity of mixed feed fed to conform with the strict definition of concentrates. To the extent it does not, we are overstating the quantities of grain fed. The degree cannot be large, however. In 1978, total production of meat, blood, and bone meal was 475 thousand tons (*Myasnaya industriya SSSR*, no. 3, 1979, p. 6); production of fish meal averaged about 600 thousand tons during 1975-77 (information exchanged under the US-USSR Agricultural Agreement. No data for 1978 were transmitted).

[77] We allocate the bulk of grain waste to feed because of the higher-than-average storage losses as well as a lesser degree of cleaning associated with grain for feed. Moreover, this would be expected under Soviet accounting procedures. Soviet farms often clean and dry drain that is to be marketed in order to avoid financial penalties for excess moisture and other elements of waste. Grain left on farms is not usually processed to the same extent.

[78] See A (ER) 75-68. The balances are updated in ER 79-10057, *USSR: Long-Term Outlook for Grain Imports*, January 1979, p. 15.

[79] The latter estimates are derived by multiplying the estimated quantity of grain required per unit of output times the quantities of livestock product produced annually in the 1950s. The estimates also take into account feed necessary to support livestock inventory change and to maintain horses. Soviet data are available on units of concentrated feed required per unit of output. See, for example, N. Burlakov, *Ek selkhoz*, no. 5, 1972, p. 36. We recognize that the amount of concentrates required per unit of output is not constant over time as implied by this methodology. Actual use of concentrates depends on quantities of other feeds available to substitute for or complement the nutrient value of grains and other concentrates as well as the mix within concentrates. However, data are not available to adjust for these fluctuations.

[80] Grain balances for the 1950s are of necessity far more crude and thus subject to larger error than those we have been able to develop for 1960 forward

Estimated quantities of grain and potatoes used for feed are lagged to be consistent with crop year data. The harvest of a given year is assumed to provide one-third of the feed used in that calendar year plus two-thirds of feed used in the subsequent calendar year. Although this assumption becomes less plausible in years of sharp crop fluctuations, we do not alter these shares over time.

Potatoes. Estimating potatoes fed to livestock presents difficulties similar to those encountered in estimating grain fed in the 1950s. In the balance, subtracting seed, food, and industrial uses from reported production leaves insufficient quantities for feed use in five of the 11 years for which we have official Soviet statistics on quantities of potatoes fed to livestock.

We believe that the data inconsistencies observed in the potato balance are caused by inaccuracy in Soviet potato statistics. Production statistics are subject to an especially large margin of error because 60 percent of potato output comes from private plots.[81] Reporting of the potato crop in the socialized sector also involves estimation. After potatoes are harvested, they may not be removed from the fields but stored in pits or piles. In this case the weight of output is estimated by taking the dimensions of the pile and determining the weight of 1 cubic meter of stored potatoes. The amount of dirt and leaves in the output is estimated by weighing several samples before and after cleaning.[82]

The potato balance is distorted on the utilization side by the fact that ungarnered potatoes left in the field are consumed by livestock permitted to scavenge.[83] Potatoes fed in this way are likely to be included in officially reported quantities of potatoes fed. This is true of all pasture feed provided to livestock without prior harvesting. The weight of "pasture feed"[84] consumed is determined by the farm's chief agronomist or zootechnician.[85] The degree to which this causes understatement in gross output is probably not large.[86]

The question of quality of the potato crop also remains unresolved. According to the literature, large losses of potato production from spoilage occur.[87] Earlier sources claim as much as one-fifth to one-third of the potatoes received by retail trade turn out to be unsaleable.[88] The ranges in Soviet estimates of potato spoilage indicate the difficulty of developing any reasonable series of discounts over time. Any adjustment would merely add an arbitrary calculation without improving the measure. Moreover, applying any discount would throw the balance further out of line.[89]

Vegetables and Whole Milk. Soviet data on feeding of vegetables to livestock are scarce; indeed, there are no published data on total vegetables fed. Consequently, our estimates have to be based on a crude balance. The few data available report vegetable feeding on state and collective farms only. Our vegetable balance is, for most years, fairly consistent with the few references available. Soviet statements such as "12 percent of vegetables produced by collective farms are fed by them,"[90] and "1.8 million tons of vegetables produced in the communal sector were fed"[91] are, as expected, below the quantities fed as implied by the balance. The understatement is probably accounted for by vegetables fed by the private sector which produces substantial quantities of vegetables and may well feed some of the surplus. Vegetables, however, are a small component of feed; error here does not have a significant impact on the overall index movement.[92]

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[81] See above for discussion of statistics of private agricultural output.

[82] M. Z. Pizengol'ts, *Bukhgalterskiy uchet v sel'skom khozyaystve*, Moscow, 1974, pp. 111-112.

[83] V. K. Radostovets et al., *Spravochnik bukhgaltera sovkhoza i kolkhoza*, Alma Ata, 1972, p. 51.

[84] Pasture feed is broadly defined to include crop residues other than grass for pasture. *Ibid.*, p. 354. M. Z. Pizengol'ts et al., *Bukhgalterskiy uchet v sel'skokhozyaystvennykh predpriyatiyakh*, Moscow, 1975, p. 94.

[85] *Ibid.*, p. 354.

[86] Raw potatoes are not particularly palatable. Chopping is recommended to increase palatability for cattle and sheep and cooking is recommended for hogs and poultry.

[87] See above for a discussion of waste in potatoes.

[88] *Pravda*, 25 August 1969, p. 2, *Sovetskaya torgovlya*, No. 9, 1971, p. 15. Some of this waste is returned to farms and fed.

[89] Although not affecting our potato balance, another unresolved question is the accounting for potatoes sold to procurement organizations. Due to a lack of sufficient storage facilities a portion of procured potatoes is left on farms for storage. Every year an unknown part of this amount is used by farms themselves (Z. G. Tresorukova, *op. cit.*, Moscow, 1974, p. 56). If quantities used by farms are not deducted from the earlier reported marketed output, procurements would be exaggerated.

[90] L.T. Dageev, *Podsobnyye promyshlenniye predpriyatiya v sel'skom khozyaystve*, Moscow, 1976, p. 14.

[91] *Pravda*, 6 August 1966, p. 2.

Whole milk fed to livestock can be estimated with a greater degree of confidence. Data for whole milk fed on state and collective farms were published for a number of years. An occasional source has noted how much whole milk is fed by the private sector, usually in percentage terms. Finally, two sources have provided benchmark data on total quantities of whole milk fed.[93] Although estimates of whole milk fed can be made with acceptable confidence, the problem of accounting for skim milk fed remains. Roughly 60 percent of total milk production is purchased by the state; about one-half of that is used for manufacture of butter. While some of the resulting fluid skim milk is dried, much of it is returned to farms for use as feed.[94] In a sense, this can be considered intrasector use since the chief criterion determining prices paid to farms for milk is butterfat content, not fluid quantities, and the prices paid by farms for the returned skim milk are negligible.[95] At any rate, we do not include an estimate of skim milk fed, although an average of 27.5 million tons of skim milk were reported fed during 1961-70.[96] Any resulting bias is small; an arbitrary calculation incorporating an estimate of skim milk fed had almost no effect on the total estimated value of feed fed.

Hatching eggs. In addition to estimating feed used in the production of livestock output, we also deduct for hatching eggs. These eggs, which amount to about 5 percent of all eggs produced, are required for hatching to produce poultry for meat and to increase poultry flocks. Few official Soviet data are available on the number of eggs used for hatching. The most recent Soviet statement, however, is consistent with our estimates.[97] Our estimate is based on the increase in poultry flocks from year to year and the relationship between poultry meat output and the number of birds necessary to produce that quantity of meat. An allowance is made for mortality in young chicks and for eggs that fail to hatch. Hatching and mortality rates can be estimated from Soviet sources.[98] Although the level of losses from both sources is higher than in the United States,[99] we assume it is reasonable since the literature contains frequent references to problems in poultry management.[100] Hatching eggs are a relatively minor item in the index and errors here are not significant. No attempt is made to construct an egg balance to test the validity of the estimates.

C. Testing the Estimates of Seed and Feed

We tested our estimates of seed and feed against the Soviet input-output tables for 1966 and 1972. We compared the shares of gross output going to seed and feed use in our index with the shares shown by the input-output tables.[101] Because the Soviet tables measure gross output and value commodities produced and used within the sector at cost,[102] some adjustments had to be made to our index to achieve comparability. For the years 1966 and 1972, we valued all seed and feed produced in the crop sector at cost.[103] Values at cost are included in output and in totals for feed use. We converted the CIA index of net crop production to a gross basis by eliminating the discounts and seed deductions from crop output. Gross livestock output is derived by eliminating the feed deduction. We then compared our index and the input-output tables for 1) the share of gross crop output used for feed, 2) the share of gross crop output used for seed, and 3) the proportion of feed from the crop sector in the gross value of livestock output. The results are summarized below:

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[92] To test the sensitivity of the index, the quantities of estimated vegetables fed were arbitrarily doubled. The change in value of all feed fed was negligible.

[93] See Appendix Table C-10.

[94] State farms, collective farms, and other state agricultural enterprises, selling milk to the state, have the right to receive skim milk according to norms set by the Councils of Ministers of the union republics. These norms differ according to republic and to type of farm. A.F. Bochalin and G.M. Rogozin, *Spravochnik po zakupkam produktov zhivotnovodstva*, Moscow, 1974, pp. 179-183.

[95] Farms are charged 10 rubles per ton. *Ibid.*, p. 179.

[96] USDA, ERS Foreign 355, *Feed Balances for the USSR*, (undated), p. 20.

[97] In May 1979, an official of the Ministry of Procurement stated that the number of eggs used for incubation amounts to about 3 billion eggs for the USSR as a whole (*Zhurnalist*, no. 5, 1979, pp. 41-43). Our estimate for 1978 is 3.2 billion.

[98] See I.N. Zamyslov, *Ekonomicheskaya otsenka otrasley zhivotnovodstva*, Moscow, 1973, p. 91; also, *Spravochnik: promyshlennoye ptitsevodstvo*, Moscow, 1971, pp. 48-116.

[99] USDA, *Agricultural Statistics 1978*, Washington D.C., 1978, pp. 403, 414.

[100] See, for example, *Finansy SSSR*, no. 11, 1973, p. 28.

[101] Data in the 1966 and 1972 input-output tables were converted to 1970 prices using indexes developed by Vladimir Treml. (See V.G. Treml, ed., *Studies in Soviet Input-Output Analysis*, Praeger Publishers, New York, 1972, pp. 218, 219, 272.)

[102] Yu. E. Gaabe et al., *Statistika sel'skogo khozyaystva*, Moscow, 1971, p. 228.

[103] This calculation does not include milk used for feed or eggs for hatching.

Percent

	1966		1972	
	Soviet	CIA	Soviet	CIA
Share of gross crops used for feed	28.3	16.7	23.7	20.5
Share of crops used for seed	8.8	6.8	9.6	6.8
Crop-sector feed as a share of gross livestock output	23.9	12.7	19.7	12.6

The results of the comparison are consistent with known differences between the Soviet and CIA indexes, and suggest that our estimates of seed and feed use are reasonable. Considering the different components of the two indexes, the comparisons are fairly close. The rise in the share of seed use between 1966 and 1972 in the Soviet data may reflect a rise in seeding rates. We have already acknowledged that our use of a constant seeding rate probably is not accurate. Although both comparisons for feed shares indicate that our index understates feed use relative to Soviet measurements, the disparity between the shares narrowed between 1966 and 1972. This result is obtained partly because our crop index does not include hay and other feed produced and used entirely within agriculture. These feeds have increased more slowly than grain, and are a declining share of feed use. The share of grain, which is included in the CIA index, has risen. We show a rising share of crop output devoted to feed use and a constant share of livestock output consisting of feed inputs. Soviet data, on the other hand, show these shares dropping. However, this trend may be due to lack of comparability between the 1966 and 1972 input-output tables.[104] It is more likely that these shares remained constant or rose between 1966 and 1972 than declined. In any case these comparisons should be regarded as general indications of the shares and not as precise measures. Intertemporal comparisons of the shares are especially tentative.

VII. Sensitivity Tests

To test the sensitivity of the index of Soviet agricultural production to various estimating procedures, we calculated several variants of the index by altering quantities and price weights. In general, procedures that raise the value of livestock sector output relative to crops, should raise the growth rate of net agricultural output, except in 1971-79 when growth in livestock output slowed significantly. Overall growth of farm output should drop when the relative share of the crop sector is raised. In any event, the index is generally insensitive to the tests we applied. None of the modifications had a material effect on the growth rates for the 1951-79 period as a whole.

The results of the tests are presented in tables 7 and 8 in terms of the changes in growth rates and in shares of livestock products and crops in total output. To rank the sensitivity tests in order of their effect on the index, we calculated an average absolute percentage difference to measure the deviation of agricultural output under the sensitivity tests from the original index in 1970 prices.[illegible] The average absolute percentage difference calculation provides an unambiguous measure of the variation among the indexes. These coefficients are shown in the last column of table 7.

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[104] There is some evidence that the USSR's definition of sales by the crop sector to animal husbandry underwent a change between construction of the 1966 and the 1972 input-output tables. Sales by the flour and bread sector to animal husbandry are inexplicably low in the 1966 input-output table compared with the 1959 and 1972 tables. The hypothesis is that the crop sector sold material inputs directly to animal husbandry in 1966 rather than to the flour and bread sector for subsequent processing and resale to animal husbandry as was the case in 1972. Research on this subject has not been completed, but if the hypothesis proves correct, the shares for gross crops used for feed and crop sector feed as a share of livestock output as reflected in input-output tables are overstated in 1966 relative to 1972.

A. Use of Alternative Discounts and Feed Values

In the first test, discounts for grain and sunflower seeds were removed from production and from feed use. In the second, output of these crops and quantities fed were discounted at a flat rate of 20 percent for grain and 8 percent for sunflower seed. In the third variant, additional discounts were made for potatoes (10 percent), vegetables (15 percent), fruits (25 percent), sugarbeets (7 percent), eggs (3 percent).[illegible] Potatoes and vegetables fed were discounted by the same percentages. The fourth and fifth tests affected livestock output directly. Feed was valued at cost of production in 1970 rather than at average realized prices for nonfeed uses on the assumption that most crops fed to livestock are not of sufficiently high quality to bring prices as high as average realized prices. In the fourth test, prices applied to changes in livestock inventory were adjusted each year for the variations in weight per procured animal over time.[illegible]

Major alterations in the discount for grain and sunflower seed and the addition of discounts for other crops have little effect on the index of total net output. The average absolute percentage difference in all cases is about 1 percent for total output. Large changes can be made in the discount without changing trends in output growth. Removing the discounts accelerates the growth of crop output slightly except for 1971-79 and raises the share of crop output in total agricultural production. Removing the discount slows growth in livestock output, while the rate of growth for total output remains virtually unchanged. The flat discount of 20 percent on grain and 8 percent on sunflower seed reduces the share of crops in total output. Growth in crop output for the periods shown rises slightly because the weather-related discount was not applied in 1950-54 and is relatively large in 1970 and 1979. Additional discounts on other crops have little effect on the index. The average absolute percentage difference is very small, indicating that discounts on other crops do not affect trends significantly.

Accounting for the variation in animal weight over time for purposes of measuring livestock inventory change causes no appreciable change in growth of livestock output. The average absolute percentage difference is 1.1 percent—less than that in crop output caused by altering the discounts. Error in total output is less than one percent. Because average slaughter weights show little change, using 1970 average realized prices to value all herd changes over time gives almost identical results to the more laborious process of adjusting the price each year for variations in animal weight.

Valuing quantities of grain, potatoes, vegetables, and whole milk fed at average cost of production in 1970—the fifth test—does not change the value of net output available for sale and home consumption. The procedure lowers the value of crop output and raises the value of livestock output by the same amount. Growth in total output remains the same. Growth in livestock output as well as its share in total output, however, increases because feed deductions are smaller. Crop output grows more slowly when the feed portion of crop output is also valued at cost.

B. Use of Alternative Price Weights

Average absolute percentage difference calculations indicate that the shift to 1960 prices has the largest effect on the index. As table 8 shows, the share of crops is raised relative to livestock output. Since 1960, prices of livestock products have risen more than crop

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[illegible] Percentage difference (D) is calculated using indexes of output in the following equation:

$$D = \frac{1}{30}\sum_{t=1950}^{1979}\frac{\text{CIA index in 1970 prices} - \text{variation}}{\text{CIA index in 1970 prices}}$$

[illegible] We adopted the 10 percent discount on potatoes used by Johnson and Kahan in their index, although Soviet sources indicate it may be too low. (D. Gale Johnson and Arcadius Kahan, "Soviet Agriculture: Structure and Growth," *Comparisons of the United States and Soviet Economies*, Joint Economic Committee, Congress of the United States, Washington, D.C., 1959.) The discounts on vegetables, fruits, sugarbeets, and eggs are suggested by Soviet sources.

[illegible] The CIA index rests on the assumption that animals in inventory are on average the same weight as those sold to procurement organizations. This assumption probably is acceptable except for very poor crop years the average weight of animals in inventory would not necessarily correspond to the average weight of animals sold.

Table 7

Sensitivity Tests of CIA Index

	Average Annual Percentage Rates of Growth				Average Absolute Percentage Difference
	1951-79	1951-60	1961-70	1971-79	
1970 prices					
Net crops	2.4	2.6	3.7	0.7	—
Net livestock	3.7	6.1	3.7	1.0	—
Total	**3.0**	**4.3**	**3.7**	**0.9**	**—**
No discounts					
Net crops	2.6	3.1	3.9	0.5	.023
Net livestock	3.5	5.7	3.6	1.0	.010
Total	**3.0**	**4.3**	**3.8**	**0.7**	**.007**
Flat discounts on grain and sunflowers					
Net crops	2.5	2.9	3.9	0.6	.022
Net livestock	3.7	6.0	3.7	1.1	.008
Total	**3.1**	**4.5**	**3.8**	**1.7**	**.008**
Additional discounts on crops and eggs					
Net crops	2.4	2.6	3.7	0.7	.002
Net livestock	3.6	6.1	3.7	1.0	.002
Total	**3.0**	**4.4**	**3.7**	**0.8**	**.002**
Varying animal weight					
Net crops	2.4	2.6	3.7	0.7	—
Net livestock	3.7	5.9	3.9	1.0	.011
Total	**3.0**	**4.2**	**3.8**	**0.8**	**.006**
Feed valued at cost					
Net crops	2.0	2.0	3.5	0.2	.023
Net livestock	4.0	6.5	3.9	1.3	.012
Total	**3.3**	**4.3**	**3.7**	**0.9**	**.002**
1960 prices					
Net crops	2.5	2.5	4.0	0.8	.013
Net livestock	3.8	6.3	3.6	1.3	.068
Total	**3.0**	**4.1**	**3.8**	**1.0**	**.012**

Table 8 Percent

Sensitivity Tests of Shares of Net Output

	1950	1960	1970	1979
1970 prices				
Net crops	55	46	46	46
Net livestock	45	54	54	54
Total	**100**	**100**	**100**	**100**
No discounts				
Net crops	55	48	49	48
Net livestock	45	52	51	52
Total	**100**	**100**	**100**	**100**
Flat discounts on grain and sunflowers				
Net crops	52	45	46	44
Net livestock	48	55	54	56
Total	**100**	**100**	**100**	**100**
Additional discounts on crops and eggs				
Net crops	53	44	44	44
Net livestock	47	56	56	56
Total	**100**	**100**	**100**	**100**
Varying animal weight				
Net crops	54	46	46	46
Net livestock	46	54	54	54
Total	**100**	**100**	**100**	**100**
Feed valued at cost				
Net crops	54	44	43	40
Net livestock	46	56	57	60
Total	**100**	**100**	**100**	**100**
1960 Prices				
Net crops	62	53	54	53
Net livestock	38	47	46	47
Total	**100**	**100**	**100**	**100**

prices.[108] As a result, the average absolute percentage difference is much larger for livestock output than for crops.

Within the livestock sector, however, when 1960 prices are used, growth accelerates sufficiently to offset the dampening effect of the increased share of crop output for all periods except 1951-60. Growth in livestock output is slower in 1970 prices than in 1960 prices because the largest price increases between these two years occurred in the slowest growing components of livestock output—herd inventories and meat production. Egg and poultry production posted the largest increases among livestock products between 1960 and 1970, but the price increase for eggs was the smallest among livestock products. The share of poultry is too small to affect growth in total livestock output.

VIII. Comparison of the CIA Index with Other Indexes of Soviet Agricultural Production

In this section we compare the CIA index with two Western indexes of Soviet agricultural production—one compiled by the Food and Agriculture Organization of the UN, and the other by the USDA. In addition, we contrast our index to the Soviet official index of gross agricultural output. Finally, we relate our index in terms of definitions and methodology to the US index of agricultural output compiled by the USDA. The following tabulation summarizes growth in Soviet agricultural production as measured by the various indexes.

	Average Annual Percentage Rates of Growth			
	1951-79	1951-60	1961-70	1971-79
Net output				
CIA index	3.0	4.3	3.7	1.5
USDA index	3.6	4.1	3.7	1.5
FAO index	NA	NA	NA	0.9
Gross output				
Official Soviet index	3.2	4.8	3.3	1.4
CIA index	3.2	4.6	3.6	1.2

Each comparison is intended to define the extent and causes of the differences in the indexes. We then attempt to reconcile the indexes being compared.

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[108] In 1962, prices paid to farms were raised for livestock, milk, eggs, and for some crops. Under the Brezhnev agricultural program, inaugurated in 1965, procurement price bonuses were established for quantities of agricultural produce delivered above the plan. Grain and milk prices were increased. In 1970, livestock prices went up and 50 percent price bonuses were introduced for sales above the plan for livestock, milk, eggs, and wool. In the 1965-1975 period, procurement prices rose by 70 percent for livestock products while crop prices rose by only 30 percent. Cattle prices rose by 77 percent and milk prices by 62 percent. Grain prices went up by only 41 percent during this period. (A. S. Baranov, *Gosudarstvenniye zagatovki v usloviyakh spetsializatsii i konsentratsii sel'skokhozyaystvennogo proizvodstva*, Moscow, 1978, p. 162.)

Our overall measure of variation is the average absolute percentage difference between the CIA index and each of the indexes being compared. The difference calculation provides a less ambiguous measure of variation than comparisons of growth rates for arbitrarily chosen periods. We supplement the difference calculations with measures of variations in growth rates and structure of output. We assess differences in sample coverage, estimating procedures, and price weights.

The final step in the comparisons is to construct a variant of the CIA index that matches the index being compared as closely as possible. By eliminating as many differences as possible between the indexes, we are able to identify many of the factors that cause the indexes to grow at different rates. In most cases, for example, this reconstruction can eliminate differences in the indexes caused by different price weights. Average absolute percentage difference calculations are used to determine whether the reconstruction improved the match between CIA index and the indexes being compared with it.

A. The Official Soviet Index of USSR Gross Agricultural Output

The official Soviet index measures gross output of agriculture. Products used for seed and crops fed are counted as output of the crop sector; feed is also included in the value of livestock production. Although the value of agricultural output is overstated in the official index, our focus is on intertemporal comparisons between the two indexes and not on the overall magnitude of production measured in rubles. To compare the CIA and Soviet indexes of agricultural output, both must be on either a net or gross basis. Given the lack of Soviet statistics on uses of output, we chose to convert the CIA index to a gross basis rather than to create a net output index from Soviet data.

The official Soviet index in 1965 comparable prices is compared with the CIA index of net agricultural output in 1970 prices and with the CIA index reconstructed to a gross output basis, weighted with Soviet 1965 comparable prices.[109] The CIA index was calculated on a gross basis by adding back the value of seed and feed and by eliminating the discounts on grain and sunflower seed. Our reconstructed index is not strictly comparable to the Soviet official index, however. Although the Soviet index is nominally in constant prices, it is actually a "linked" index incorporating several sets of price weights.[110]

Data are not available to correct the official Soviet index for this deficiency. Furthermore, we did not allow for crops included in the official Soviet index but excluded from the CIA index. (See Table 2.)

Table 9 shows that the average absolute percentage difference between the Soviet gross output index and the CIA net output index is 3.6. The difference is smaller for crops than for livestock, indicating that omissions from the CIA crop sample are not a source of serious bias in the index. Despite more similar coverage, the CIA index of livestock output is farther from the Soviet variation than is the index of crop output. The CIA measure of net output grows at approximately the same rate as the Soviet measure of gross output during the 1951-79 period, even though growth rates for crops and livestock in the two indexes do not agree well. Growth rates for total output match because differences in growth of crop and livestock indexes are offset by differences in CIA and Soviet weights used to aggregate crop and livestock output into total agricultural production. As table 10 shows, for the past two decades crops and livestock contributed equally to Soviet gross output while the CIA index (both gross and net) gave greater weight to

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[109] In the Soviet definition of comparable prices, marketed output is valued at actual sale prices while products used entirely within the sector are valued at cost. Private sector production that is not marketed is valued at the average price for marketed output of the particular commodity. A complete list of 1965 comparable prices used in the official Soviet index and in our reconstruction of the CIA index is found in F.E. Savitskiy et al., *Spravochnik po planirovaniyu sel'skogo khozyaystva*, Moscow, 1974, pp. 462-464.

[110] According to Soviet statistical handbooks, 1950 indexes are expressed in 1926/27 prices; 1951-55 are in 1951 prices; 1956-57 are in 1956 prices; 1958-64 are in 1958 prices; 1965-75 are in 1965 prices, and since 1976, the index has been calculated in 1973 prices. When a new set of price weights is introduced, the total ruble value of agricultural output is adjusted by one aggregate price index instead of a detailed set of deflators. The procedure is not equivalent to revaluing each item in the index in new prices. Trends in the official index, therefore, are affected by this imperfect transition from one set of price weights to another.

Table 9

Comparison of CIA and Soviet Official Indexes of Agricultural Production

	Average Annual Percentage Rates of Growth				Average Absolute Percentage Difference
	1951-79	1951-60	1961-70	1971-79	
Soviet official 1965 prices					
Total	**3.2**	**4.8**	**3.3**	**1.4**	—
Crops	2.8	4.1	3.3	0.8	—
Livestock	3.9	6.4	3.3	2.0	—
CIA-net output 1970 prices					
Total	**3.0**	**4.3**	**3.7**	**0.9**	**.036**
Crops	2.4	2.6	3.7	0.7	.013
Livestock	3.7	6.1	3.7	1.0	.074
CIA-gross output 1965 prices					
Total	**3.2**	**4.6**	**3.6**	**1.2**	**.015**
Crops	2.4	3.0	3.6	0.5	.012
Livestock	3.9	6.2	3.6	1.8	.018

livestock output. In 1979, largely as a result of the poor crop output, the share of gross output originating in the livestock sector increased relative to crops in the official Soviet index.

The reconstruction of the CIA index on a gross basis with 1965 Soviet comparable prices eliminates differences in growth rates for total output and livestock output for 1951-79. Growth rates do not match for intervening periods; differences are especially large for 1971-79. Furthermore, growth rates in the CIA and Soviet indexes of gross crop production remain far apart. In eliminating deductions for intrasector use of crops as a source of disparity, we discovered that the amount of deviation between the two indexes due to intrasector use is evidently small. Differences in sample coverage probably are responsible for much of the remaining difference between the two indexes.

Average absolute percentage difference calculations reveal that despite occasional large differences in growth rates, the reconstructed CIA index of gross crop output is very close to the Soviet index. Although growth rate comparisons suggest more correspondence between the Soviet and CIA reconstructed livestock indexes, average annual difference calculations indicate that trends in these indexes vary more than those in the crop indexes. However, on average, the CIA reconstructed gross output indexes of crops, livestock, and total output differ from the official index by less than 2 percent which is not material.

Although the reconstruction of the CIA index on a gross basis reduced the average absolute percentage difference to 1.5 percent, the disparity in the weights for crops and livestock in total output increased. Eliminating the deduction of livestock feed from livestock production in the CIA index did not improve the correspondence between CIA and Soviet weights except for 1950. We attempted to eliminate some of the discrepancy by adding a rough estimate of the value of hay and green feed produced to crop output. As a result the share of crops rose from 46 to 47 percent.

The shift to 1965 comparable prices caused growth of livestock output in the CIA index to accelerate sharply in periods before 1960. Total output grows more slowly than the Soviet official measure, however.

Table 10

Comparison of Structure of Output in Soviet and CIA Indexes, Percentage Shares

	1950	1960	1970	1979
CIA index, 1970 prices (net output)				
Crops	55	46	46	46
Livestock	45	54	54	54
Total	**100**	**100**	**100**	**100**
CIA index, 1965 prices (gross output)				
Crops	58	46	46	43
Livestock	42	54	54	57
Total	**100**	**100**	**100**	**100**
Soviet official index (gross output)				
Crops	56	51	51	48
Livestock	44	49	49	52
Total	**100**	**100**	**100**	**100**

After 1960, the increased weight of the livestock sector causes the CIA index of gross output to grow faster than the Soviet index. The CIA measure of total gross agricultural output grows at 2.9 percent for the 1961-79 period as a whole, while the Soviet index grows at 2.4 percent. Crop output grew more slowly than livestock output during the period. If the CIA index had a more complete crop sample, thus decreasing the weight of the livestock sector, growth in gross output would slow.

B. The FAO Index

The Food and Agriculture Organization (FAO) of the United Nations publishes annually an index of net agricultural output for the world as a whole and for 149 individual countries.[illegible] The output indexes are weighted with 1969-71 average producer prices of the given country and incorporate deductions for seed, feed, hatching eggs, and for waste. The FAO index for the USSR differs from the CIA index because changes in livestock inventories are excluded and because certain semiprocessed feeds such as bran and oilcake are deducted. Meat output in the FAO index, moreover, is registered in terms of liveweight. Sample coverage in our index and the FAO index is similar, especially for crops. In the livestock sector, however, the FAO index includes animal hides, cheese, dry milk, and other milk products.

Table 11 compares the CIA and FAO indexes of net Soviet agricultural output for those years covered by the FAO index.[illegible] Although the CIA and FAO indexes have similar price weights, the average absolute percentage difference between the two indexes is 4 percent. When the change in livestock inventories is removed from the CIA index in 1970 prices, the CIA-FAO match is improved considerably; the direction of change becomes the same in each year; and the average difference falls to about 1 percent.

Average annual rates of growth for the 1967-79 period as a whole differ slightly; removal of livestock inventory change eliminates the difference. In comparing the 1971-76 period, the two indexes initially differ by a large amount. Again, however, the difference is virtually eliminated when livestock inventory change is removed from the CIA index. Using growth rates to assess the similarity of these indexes is thus ambiguous. We place more weight on the average absolute percentage difference calculation that shows the FAO and reconstructed CIA indexes to be the best match achieved in any of our reconstructions.

C. The USDA Index of Soviet Agricultural Output

The USDA publishes indexes of agricultural production for Europe and the USSR.[illegible] The index for the USSR is weighted with 1969-71 average prices received by farmers in Western Europe converted to US dollars at official exchange rates. Production data are official Soviet output statistics. A constant 38-percent

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[illegible] *FAO Production Yearbook*, Food and Agriculture Organization of the United Nations, Rome, 1979, Vol. 33, p. 78.

[illegible] The FAO revised the index in 1977. Data in earlier editions of the yearbook are not comparable with currently published data. Older versions of the index are weighted with 1961-65 average wheat-based price relatives. These weights are derived by expressing the national producer prices for all commodities as a percentage of the national producer price of an equal weight of wheat. The older index included a greater number of processed products such as wine and refined sugar.

[illegible] The current version of the index was published in May, 1981, after research for this paper was completed. Unpublished data provided by USDA were used to compare the CIA and revised USDA indexes. The most recent USDA publication is *Indices of Agricultural and Food Production for Europe and the USSR*, ESCS, Statistical Bulletin no. 620, June 1979.

Table 11

Comparison of CIA and FAO Indexes of Soviet Agricultural Production, 1966-79 [a]

	FAO 1969-71 Prices	CIA 1970 Prices	CIA Less Livestock Inventory Change 1970 Prices
1966	91.2	86.6	89.2
1967	93.1	86.6	92.6
1968	97.1	91.7	97.7
1969	92.2	89.0	92.9
1970	100.0	100.0	100.0
1971	102.0	99.6	102.1
1972	97.1	94.0	99.3
1973	113.7	107.8	111.3
1974	108.8	106.5	111.0
1975	106.9	98.2	106.2
1976	111.8	106.1	110.9
1977	113.7	111.0	113.6
1978	122.5	114.6	119.0
1979	115.7	107.9	113.0
Average annual rates of growth (percent)			
1967-70	2.3	3.7	2.9
1971-76	1.9	1.0	1.7
1967-79	1.8	1.7	1.8
Average absolute percentage difference		044	012

[a] 1970 = 100

deduction is applied to the value of livestock output to account for use of domestic and imported feed. The feed share is estimated according to the relationship between the value of feeds (excluding forage) and the value of livestock products in 1969-71.[114] No deductions are made for seed use; grain and sunflower seed are not reduced by a waste allowance.

Sample coverage in the USDA index resembles that of the CIA index with some minor exceptions. The USDA index includes only sunflower seed in oilcrop production. In livestock production, the USDA index omits production of honey, silk cocoons, other meat, and livestock inventory change.

Table 12 compares growth in the CIA and USDA indexes for the years 1950-79. For the period as a whole and for 1971-79 the USDA index shows faster growth in all categories. The USDA crop index places more weight on output of fruits and vegetables than on grain and potatoes. During 1951-79 fruit and vegetable production grew at an average annual rate of 5.1 percent while grain and potatoes grew by only 1.4 percent. The CIA crop index weights output of grain and potatoes more heavily than fruits and vegetables and therefore grows more slowly. The average absolute percentage difference for crops is only two percent, however, while the difference for livestock is almost 7 percent.

To assess the effect of the differing methodologies, a variant of the CIA index was constructed using gross crop production, eliminating livestock inventory change, and applying a 38-percent feed allowance to the value of livestock output. This procedure reduced the difference for livestock significantly, but the difference for the crop series increased. By eliminating grain discounts and seed deductions to create a variant of the CIA crop index definitionally comparable to that of USDA, we increased the weight of grain and potatoes. The effect of this change was to widen the gap in growth between the two crop indexes.

Table 13 compares the indexes in terms of crop and livestock shares of net agricultural output. Since 1960 the USDA index shows livestock as representing only about one third of total agricultural output whereas in the CIA index livestock has accounted for more than half of the total value of output since 1960. The CIA index constructed with USDA methodology increases the relative share of crops but this share is still below that in the USDA index.

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[114] The USDA 38-percent share is higher than the share of crop-sector feed in livestock output as shown in the 1972 input-output table in current prices. Even when purchases by animal husbandry from the food industry are added, the share of feed in livestock output is still under 30 percent. Crop-sector feed as a share of livestock output in the CIA index is about 20 percent in the 1969-71 period; it includes only feeds counted elsewhere in the index. In subtracting 38 percent of livestock output for feed, the USDA appears to be deducting more feed than is counted in the output index.

Table 12

Comparison of CIA and USDA Indexes of Soviet Agricultural Production

	Average Annual Percentage Rates of Growth				Average Absolute Percentage Difference
	1951-79	1951-60	1961-70	1971-79	
USDA Index					
Crops	2.7	3.2	3.7	0.9	—
Net livestock	4.0	5.9	3.5	2.5	—
Total	**3.1**	**4.1**	**3.6**	**1.5**	—
CIA Index (net output, 1970 prices)					
Crops	2.4	2.6	3.7	0.7	.018
Livestock	3.7	6.1	3.7	1.0	.068
Total	**3.0**	**4.3**	**3.7**	**0.9**	**.032**
CIA Index (USDA methodology, 1970 prices)					
Crops	2.3	2.8	3.5	0.4	.027
Livestock	4.0	6.1	3.3	2.4	.009
Total	**2.9**	**4.0**	**3.4**	**1.2**	**.025**

Table 13 Percentage shares

Comparison of Structure of Output in CIA and USDA Indexes

	1950	1960	1970	1979
USDA index				
Crops	70	64	65	62
Livestock	30	36	35	38
Total	**100**	**100**	**100**	**100**
CIA index, 1970 prices				
Crops	55	46	46	46
Livestock	45	54	54	54
Total	**100**	**100**	**100**	**100**
CIA index in USDA methodology, 1970 prices				
Crops	66	58	59	54
Livestock	34	42	41	46
Total	**100**	**100**	**100**	**100**

The remaining differences between the indexes are caused by the differences in the price weights. In using prices of Western Europe to value output, the USDA index "understates" somewhat the value of livestock products in terms of Soviet relative prices. Prices for most livestock products compared to crops are relatively lower in Western Europe than in the USSR. Relative prices for crops are more alike in the two systems although Western European grain and potatoes are cheaper relative to other food crops. Table 14 compares relative prices for selected commodities in the two indexes. In each case, all prices are expressed as index numbers with the wheat price equal to 100. The table shows clearly the disparity in crop prices as opposed to livestock prices in the two systems.

D. The US Index of Agricultural Output

Both the CIA index of Soviet agricultural production and the official Soviet index of gross agricultural production can be compared with the US index of farm output, which measures farm output on both a gross and a net basis.[115]

[115] A complete description of the US index is found in USDA, *Major Statistical Series of the U.S. Department of Agriculture*, vol. 2, 1970, pp. 15-17. The index is published on an annual basis in the USDA statistical handbook. Data for the most recent years are reported in USDA, *Agricultural Statistics, 1978*, Washington, D.C., 1978, p. 445.

Table 14

Comparison of Relative Prices in CIA and USDA Indexes of Soviet Agricultural Production [a]

	USDA Index	CIA Index
Food crops		
Wheat	100.0	100.0
Rye	86.0	112.6
Barley	89.5	78.6
Potatoes	89.5	110.7
Vegetables	278.9	158.3
Fruits	200.0	273.8
Technical crops		
Cotton	1358.1	538.8
Sunflower seed	193.0	181.6
Fiber flax	789.5	2275.7
Livestock products		
Beef and veal	2021.1	2382.5
Pork	1875.4	2186.4
Poultry	1856.1	2299.0
Milk	177.2	190.3
Eggs	1628.1	176.7
Wool	3877.2	4514.6

[a] Wheat = 100

The US gross output index includes seed and feed and is similar in other ways to the official Soviet index. In both indexes, the value of hay and harvested roughage (silage and forage) is included in crop production. Both include a large number of items with many more in the crop sample than in the livestock sample. The US index includes 111 individual crops and 29 items for the livestock sector. The US index covers 95 percent of total output, which is somewhat better coverage than our sample of Soviet agricultural production. The US and Soviet indexes also have in common the use of different price weights for different periods. The US index uses 1957-59 average realized prices for years since 1955, 1947-49 prices for 1939-53, and 1935-39 prices for years before 1939.[116] The Soviet index is considerably more fragmented. In the period 1950-1979, it incorporates prices of 1951, 1956, 1958, 1965, and 1973. The two indexes are based on quite different sources of data, however. The US index is based on sample survey data supplemented by probability sampling. The Soviet output statistics are theoretically a literal enumeration of all production in collective farms and state agricultural enterprises, with the private sector output based on sampling.

In estimating net farm output in the United States, the USDA encounters some of the same difficulties involved in constructing the CIA index of Soviet output. First, in both cases it was impossible to make complete deductions for all seed produced and used within agriculture. The US index deducts only hayseed, pasture seed, and cover crop seed. No deductions are made for other types of seed. We deduct only seed for grain and potatoes from Soviet gross output. In both indexes, data are insufficient to deduct the value of pasture feed from livestock production. Although the US index excludes intrasector use of agricultural commodities in estimating net output, no allowance is made for waste. Waste, however, is a much less serious problem in US statistics than in Soviet statistics.

[116] Because more than one set of price weights is used in the index, the series is spliced in 1940 and 1955 using calculations both in old and new prices for those years.

APPENDIX A

USSR: Derivation of Quantity Data Used in the Index of Soviet Agricultural Production

This appendix lists the sources for the quantities used in the index of Soviet agricultual production. The index itself is shown in table A-1. Table A-2 summarizes the gross output data for crops; table A-3 contains data for output of livestock products and changes in livestock inventories. Gross output of grain and sunflower seeds is discounted for excess moisture and waste before it is used in the index, presented in table A-1.

Grain

Grain production is taken from official Soviet statistics, except for 1951 and 1952 which are estimates. The index uses unrounded data for nine individual types of grain. A figure for "other grain" is calculated by subtracting production of the nine types from the official total. Sources for statistics used in the index are listed below. Unless otherwise indicated, the source cited reports data to the nearest thousand tons for total grain production and for each individual type of grain.

1979: *Vest stat*, no. 9, 1980, p. 75.
1978: *Vest stat*, no. 10, 1979, p. 75.
1977: *Vest stat*, no. 10, 1978, p. 91.
1976: *Vest stat*, no. 9, 1977, p. 89.
1975: *Narkhoz 1975*, pp. 360-366 contains unrounded production data for all grains except oats and barley. For these grains, data are from USDA Foreign Agricultural Service reporting, SS 7003, 18 February 1977, p. 70.
1974: Production of all grains except rice is reported in *Vest stat* no. 10, 1975, p. 88. Rice production is reported in *Narkhoz 1975*, p. 365.
1973: *Vest stat*, no. 10, 1975, p. 88.
1973: *Vest stat*, no. 10, 1974, p. 88 reports unrounded production data for all grains except rice which is reported in *Narkhoz 1975*, p. 365.
1971: *Narkhoz 1974* pp. 355-362 reports unrounded production data for all grains except oats, barley, and rice. Data for oats and barley are taken from *Narkhoz SSSR 1922-1972*, p. 222, and data for rice from *Narkhoz 1975*, p. 365.
1960-70: Unrounded data for all years and for all types of grain are reported in *Selkhoz 1971*, pp. 154-191.
1950, 1953-59: Unrounded data for all years and for all types of grain are found in *Selkhoz 1960*, pp. 202-203.
1951-52: Figures for total grain production and for output of wheat and rye are reporting in *Selkhoz 1971*, p. 152. Production of other grains was estimated using indexes of 1) total production, 2) wheat and rye output, and 3) the residual obtained by subtracting wheat and rye output from total grain production. Estimates of individual types of grain are as follows.

Buckwheat, oats, pulses

Output in 1950 is moved to 1951 and 1952 using an index of the residual obtained by subtracting wheat and rye output from total grain.

Rice

Output in 1951 and 1952 is arbitrarily held constant at the 1950 level.

Corn for grain

CIA/RR ER 64-33, *Production of Grain in the USSR*, p. 28.

Barley

Output in 1950 is moved to 1951 and 1952 using an index of total grain production.

Millet

An index of wheat output is used to move 1950 millet output to 1951 and 1952.

Other grain
Other grain is estimated for 1951 and 1952 by subtracting the production of nine individual types from the total.

Potatoes
1976-79: *Narkhoz 1979*, p. 253.
1971-75: *Narkhoz 1975*, p. 371.
1950-70: *Selkhoz 1971*, p. 206.

Vegetables
1976-79: *Narkhoz 1979*, p. 254.
1971-75: *Narkhoz 1975*, p. 373.
1950-70: *Selkhoz 1971*, p. 211.

The total harvest is distributed by type of vegetable according to the percentage distribution of state procurements of vegetables by type. State procurement statistics are available for 1950, and 1960-70 in *Selkhoz 1971* pp. 68-70 and in *Selkhoz 1960* p. 103. Percentage distributions of procurements for 1951-1959 are estimated by a straight-line interpolation of the 1950 and 1960 distributions. From 1971 forward, the 1970 percentage distribution is used. Figures for the production of vegetables by type in the socialized sector are available for recent years. Since these figures exclude the large quantity of vegetables produced in the private sector, the 1970 distribution of total procurements is used.

Fruits, berries, nuts
1975-79: *Narkhoz 1979*, p. 259.
1971-74: *Narkhoz 1975*, p. 381.
1960, 1965-70: *Selkhoz 1971* p. 237.
1958, 1963-64: *Narkhoz 1965*, p. 297.
1953, 1959, 1961-62: *Narkhoz 1962*, p. 297.
1956-57: *Selkhoz 1960*, pp. 254, 256.
1955: *Narkhoz 1960*, p. 446. Published statistics for 1955 exclude citrus production. An arbitrary allowance of 40,000 tons has been added to the published figure.
1954: Calculated from average annual production for 1954-58 given in *Narkhoz 1960*, p. 375. An arbitrary allowance of 40,000 tons of citrus fruit was added to the official total.
1951-52: Straight line interpolation.
1950: *Narkhoz 1967*, p. 410.

Sugarbeets (procurements)
1976-79: *Narkhoz 1979*, p. 256.
1971-75: *Narkhoz 1975*, p. 376.
1950-70: *Selkhoz 1971*, p. 197.

Cotton
1976-79: *Narkhoz 1979*, p. 250.
1972-75: *Narkhoz 1975*, p. 367.
1950-70: *Selkhoz 1971*, p. 194.

Tobacco and Makhorka
1979: *Vest stat*, no. 9, 1980, p. 76.
1975-78: *Narkhoz 1978*, p. 203.
1970-74: *Narkhoz 1974*, p. 319.
1960, 1965-70: *Selkhoz 1971*, p. 52.
1963-64: *Narkhoz 1965*, p. 268.
1961-62: *Narkhoz 1962*, p 239.
1950, 1953, 1955-59: *Selkhoz 1960*, p. 90.
1954: Calculated from annual average procurements for 1954-58 as given in *Narkhoz 1962*, p. 239.
1951-52: Straight line interpolation between 1950 and 1953.

Sunflower seed
1976-79: *Narkhoz 1979*, p. 252.
1971-75: *Narkhoz 1975*, p. 370.
1950-70: *Selkhoz 1971*, p. 203.

Soybeans
1979: *Vest stat*, no. 9, 1980, p. 76.
1978: *Vest stat*, no. 10, 1979, p. 75.
1977: Total soybean production is estimated on the assumption that production in the RSFSR accounts for 96 percent of the total, as was the case in 1971-74. For these years, data on total production are available (see below). Data on RSFSR production for 1971-74 are from *Narkhoz 1975*, p. 209. Comparison of RSFSR and all-USSR production statistics shows that the annual average ratio of RSFSR production to total output is 96 percent. Data on 1977 production of soybeans in the RSFSR are found in *Narkhoz RSFSR 1977*, p. 123.

1976: *Vest stat*, no. 9 1977, p. 90.
1975: USDA *Agricultural Situation: Review of 1978 and Outlook for 1979*, Economics, Statistics, and Cooperatives Service, April 1979, p. 12.
1973-74: *Vest stat*, no. 10, 1975, p. 89.
1971-72: *Vest stat*, no 10, 1974, p. 89.
1960, 1965, 1970: *Maslo-zhirovava promyshlennost'*, no. 8, 1972, p. 8.
1963-64, 1966-69: Total soybean production is estimated on the assumption that RSFSR production accounts for 98 percent of total output (*Ek selkhoz*, no. 7, 1973, p. 46). Soybean production in the RSFSR for the relevant years is reported in *Narkhoz RSFSR 1965*, p. 243 and *Narkhoz RSFSR 1969*, p. 184.
1961-62: Straight line interpolation between 1960 and 1963.
1950, 1953-59: *Selkhoz 1960*, p. 202-203.
1951-52: Output in 1950 is moved forward to 1951 and 1952 using an index of sown area from *Posevnyye ploshchadi SSSR*, vol. 2, Moscow, 1957, p. 94.

Other oilseeds

This category includes castorbeans, mastard seed, flaxseed, hemp seed, tung nuts, peanuts, falseflax, rape, colza, sesame, and others. Output is estimated by subtracting production of soybeans and sunflower seeds form total oilseed output. Total oilseed production is reported in the following sources.
1975-79: *Narkhoz 1979*, p. 220.
1970-74: *Narkhoz 1975*, p. 318.
1950, 1960-69: *Selkhoz 1971*, pp. 148-149.
1953, 1959: *Narkhoz 1962*, pp. 234-235.
1956-58: *Selkhoz 1960*, pp. 26-27.
1955: *Narkhoz 1960*, p. 375.
1954: Calculated from 1954-58 average production given in *Narkhoz 1960*, p. 375.
1951-52: Estimated by moving 1950 total oilseed production forward with an index of sunflower seed production.

Fiber flax

1976-79: *Narkhoz 1979*, p. 120.
1971-75: *Narkhoz 1975*, p. 369.
1950-70: *Selkhoz 1971*, p. 201.

Tea (procurements)

1975-79: *Narkhoz 1979*, p. 261.
1971-74: *Narkhoz 1975*, p. 382.
1960-70: *Selkhoz 1971*, p. 239.
1953, 1955-59: *Selkhoz 1960*, pp. 90, 257.
1951-52, 1954: Total tea procurements are estimated by moving 1950 procurements forward with an index of tea procurements in Georgia, which accounts for over 95 percent of Soviet tea procurements. Procurement figures for Georgia are found in *Narodnoye khozyeystvo Gruzinskoy SSR v 1962 gody*, Tbilisi, 1963, pp. 134-135.
1950: *Strana sovetov za 60 let*, Moscow, 1967, p. 147.

Milk, eggs, wool

1979: *Vest stat*, no. 9, 1980, p. 79.
1978: *Vest stat*, no. 10, 1979, p. 78.
1954-77: *Vest stat*, no. 6, 1979, p. 66.
1953: *Selkhoz 1960*, p. 350, 355, 360.
1951-52: *Narkhoz 1967*, p. 332.
1950: *Narkhoz 1965*, p. 378, 474, 476.

Honey

1979: *Vest stat*, no. 9, 1980, p. 79.
1978: *Vest stat*, no 10, 1979, p. 78.
1977: *Vest stat*, no. 10, 1978, p. 95.
1976: *Vest stat*, no. 9, 1977, p. 90.
1975: Straight line interpolation.
1973-74: *Vest stat*, no. 10, 1975, p. 95.
1972: *Vest stat*, no. 10, 1974, p. 93.
1972: Straight line interpolation
1950, 1960-70: *Selkhoz 1971*, p. 322.
1953, 1956-59: *Selkhoz 1960*, p. 333.
1951-52, 1954-55: Straight line interpolation

Silk cocoons

1979: *Vest stat*, no. 9, 1980, p. 79.
1978: *Vest stat*, no. 10, 1979, p. 78.
1975-77: *Narkhoz 1978*, p. 203.
1965, 1970-74: *Narkhoz 1975*, p. 325.
1950, 1960 1966-69: *Selkhoz 1971*, p. 53.
1963-64: *Narkhoz 1965*, p. 268.
1961-62: *Narkhoz 1962*, p. 238.
1953, 1955-59: *Selkhoz 1960*, p. 91.
1954: Calculated using data on annual average procurements for 1954-58 and on annual procurements for 1955-58.
1951-52: Straight line interpolation.

Meat

Unrounded data for total meat production are readily available in Soviet statistical handbooks. Unrounded production statistics for each individual type of meat appear less consistently. Production of individual types is subtracted from the official figure for total meat output to derive "other" meat production. Statistics on total meat production are taken from:

1979: *Vest stat*, no. 9, 1980, p. 79.
1978: *Vest stat*, no. 10, 1979, p. 78.
1954-77: *Vest stat*, no. 6, 1979, p. 66.
1953: *Selkhoz 1960*, p. 338.
1951-52: *Zhivotnovodstvo SSSR*, Moscow, 1959, p. 161.
1950: *Selkhoz 1960*, p. 289.

Production statistics for individual types of meat were drawn from the following sources.

1979: *Vest stat*, no. 9, 1980, p. 79.
1978: *Vest stat*, no. 10, 1979, p. 78.
1977: *Vest stat*, no. 10, 1978, p. 95
1976: *Vest stat*, no. 9, 1977, p. 93.
1975: *Narkhoz 1978*, p. 250.
1973-74: *Vest stat*, no. 10, 1975, p. 95.
1972: *Vest stat*, no. 10, 1974, p. 93.
1971: *Proizvodstvo produktov zhivotnovodstva v 1972 godu*, Moscow, 1973, p. 10.
1950, 1960-1970: *Selkhoz 1971*, p. 290
1953, 1956-59: *Selkhoz 1960*, p. 333-335.
1954-55: *Zhivotnovodstvo SSSR*, Moscow, 1959, p. 159.
1951-52: Except for pork, statistics are from *Narkhoz 1967*, p. 332. The pork figure is found in *Zhivotnovodstvo SSSR*, Moscow, 1959, p. 162.

Livestock Investories, 1 January

1980: *Pravda*, 26 January, 1980.
1979: *Narkhoz 1978*, pp. 246-247.
1966, 1971, 1976-78: *Narkhoz 1977*, pp. 256-257.
1972-75: *Narkhoz 1975*, pp. 391-392, 395.
1951, 1961-65, 1967-70: *Selkhoz 1971*, pp. 246-249, 272.
1954-60: *Selkhoz 1960*, pp. 266-269, 320; and *Narkhoz 1960*, p. 457.
1953: *Zhivotnovodstvo SSSR*, Moscow 1959, pp. 29, 31-33.
1950, 1952: *Narkhoz 1967*, p. 425. Figures for poultry flocks for 1950, 1952, 1953, and 1956 are interpolated.

Table A-1

Million rubles

USSR: Value of Net Agricultural Output, 1950-79

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total grain	6600.1	6168.0	7488.6	6404.4	6657.8	7700.1	8869.7	7256.4	9858.9	8564.8
Food grains	4205.0	4312.1	5055.8	4563.9	4803.8	4748.6	5962.6	5318.0	6973.1	6409.5
Feed grains	2395.1	1855.9	2432.8	1840.5	1854.0	2951.2	2907.1	1938.4	2985.8	2155.3
Potatoes	8253.3	4867.9	6109.9	6473.9	6666.0	6210.5	8953.6	7892.8	7801.0	7801.6
Vegetables	1345.8	1286.4	1435.4	1689.6	1783.4	2132.1	2185.3	2275.0	2312.8	2317.5
Oil crops	479.5	463.9	594.4	621.0	427.0	813.9	853.0	627.3	974.0	644.8
Fruits, berries, nuts	803.7	837.3	870.8	904.7	989.8	1080.1	970.1	1394.2	1366.6	1396.2
Sugarbeets	512.3	607.8	571.8	595.2	507.6	797.3	817.9	1001.9	1326.6	1075.6
Cotton	1964.1	2068.5	2097.9	2138.4	2331.0	2154.0	2404.3	2337.1	2408.7	2578.0
Tobacco	123.1	137.7	152.3	169.0	194.0	169.0	164.8	212.8	208.6	233.6
Makhorka	50.1	49.5	48.3	47.7	39.6	62.9	69.3	51.2	59.4	41.3
Fiber flax	597.7	452.4	499.3	379.7	511.0	893.1	1221.2	1031.4	1026.7	853.2
Tea	79.8	89.2	91.8	103.4	103.6	113.7	103.4	105.7	129.9	137.0
Total crops	**20809.6**	**17028.5**	**19960.4**	**19527.0**	**20210.8**	**22126.5**	**26612.6**	**24185.8**	**27473.1**	**25643.5**
Index (1970 = 100)	54.048	44.227	51.842	50.717	52.493	57.468	69.120	62.817	71.355	66.603
Annual growth (percent)	0.0	−18.17	17.22	−2.17	3.50	9.48	20.27	−9.12	13.59	−6.66
Meat	11262.2	10887.7	11910.9	13557.0	14705.2	14830.7	15411.0	17181.1	17898.0	20715.1
Milk	6921.0	7095.2	6997.2	7149.1	7486.6	8429.8	9625.8	10731.0	11500.1	12096.3
Eggs	1169.7	1330.0	1440.0	1605.9	1717.9	1848.1	1953.2	2226.9	2304.0	2559.4
Wool	835.1	892.8	1018.3	1091.8	1069.5	1189.5	1214.1	1343.4	1496.4	1657.3
Honey	291.2	304.0	318.4	332.8	331.2	329.6	329.6	368.0	332.8	336.0
Silk cocoons	126.5	128.5	130.6	132.1	135.1	124.4	143.3	121.9	144.3	151.0
Livestock change	272.0	1709.1	−453.8	888.2	−191.5	1695.7	2595.1	3425.9	3053.5	2657.5
Gross livestock output	**20877.6**	**22347.4**	**21361.6**	**24757.0**	**25254.1**	**28447.8**	**31272.1**	**35398.2**	**36729.1**	**40172.6**
Net livestock output	**17321.1**	**18740.5**	**17671.1**	**20743.1**	**20941.2**	**24360.5**	**26328.3**	**28668.4**	**29714.9**	**33045.1**
Index (1970 = 100)	38.444	41.594	39.221	46.039	46.479	54.068	58.436	63.630	65.952	73.343
Annual growth (percent)	0.0	8.19	−5.71	17.38	0.96	16.33	8.08	8.89	3.65	11.21
Total net farm output	**38130.6**	**35769.0**	**37631.6**	**40270.1**	**41152.0**	**46487.1**	**52940.9**	**52854.2**	**57188.0**	**58688.6**
Index (1970 = 100)	45.634	42.808	45.037	48.195	49.250	55.635	63.359	63.255	68.442	70.237
Annual growth (percent)	0.0	−6.19	5.21	7.01	2.19	12.96	13.88	−0.16	8.20	2.62
Three-year moving average		37177.1	37890.2	39684.5	42636.4	46860.0	50760.7	54327.7	56243.6	57956.6
Index (1970 = 100)		46.264	47.151	49.384	53.058	58.314	63.168	67.607	69.991	72.122
Annual growth (percent)		0.0	1.92	4.74	7.44	9.91	8.32	7.03	3.53	3.05

Table A-1

Million rubles

USSR: Value of Net Agricultural Output, 1950-79 (continued)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Total grain	9184.4	10278.5	11045.6	7665.9	11389.2	9012.5	13387.2	11120.4	13425.6	11884.0
Food grains	6024.6	6473.1	6916.1	4306.0	6625.2	5817.9	9302.5	7141.4	9053.6	6957.4
Feed grains	3159.9	3805.3	4129.5	3359.8	4764.0	3194.6	4084.7	3979.0	4372.0	4926.6
Potatoes	7638.0	7683.6	6058.8	6348.0	8834.1	8243.7	8197.5	9078.4	9851.0	8708.3
Vegetables	2625.2	2599.0	2571.7	2308.1	3016.4	2836.3	2907.3	3188.5	3050.2	3003.9
Oil crops	796.7	1006.0	1002.0	928.8	1235.6	1127.3	1332.0	1393.5	1402.3	1265.7
Fruits, berries, nuts	1393.6	1424.1	1685.8	1807.9	1936.2	2284.2	2201.0	2528.4	2995.1	2669.7
Sugarbeets	1357.1	1241.3	1142.6	1077.8	1979.2	1755.0	1812.6	2121.1	2188.4	1697.4
Cotton	2380.4	2507.5	2388.7	2891.5	2933.2	3142.4	3319.5	3313.3	3299.5	3167.9
Tobacco	214.9	208.6	212.8	254.5	383.8	352.5	371.3	448.5	448.5	406.8
Makhorka	40.7	19.2	17.5	16.3	25.0	25.0	22.1	18.6	26.8	22.7
Fiber flax	996.2	935.3	1012.6	890.7	811.0	1125.1	1080.6	1136.8	942.3	1141.5
Tea	153.9	151.9	168.2	183.9	182.1	185.2	223.9	220.3	215.3	229.9
Total crops	**26781.2**	**28054.9**	**27306.2**	**24373.5**	**32725.9**	**30089.4**	**34855.0**	**34567.9**	**37844.8**	**34197.8**
Index (1970 = 100)	69.558	72.866	70.921	63.304	84.997	78.150	90.527	89.782	98.293	88.821
Annual growth (percent)	4.44	4.76	−2.67	−10.74	34.27	−8.06	15.84	−0.82	9.48	−9.64
Meat	20359.3	20256.9	22002.4	23687.8	19334.2	23111.6	24924.9	26857.7	27282.6	27683.6
Milk	12096.7	12262.7	12530.5	12004.6	12399.4	14222.3	14894.4	15664.3	16129.8	15981.8
Eggs	2746.4	2930.9	3008.9	2852.3	2669.4	2906.8	3167.2	3392.2	3567.9	3719.0
Wool	1659.1	1703.3	1727.0	1733.1	1584.3	1659.6	1724.7	1834.4	1930.2	1812.1
Honey	337.0	396.8	328.0	350.4	342.4	306.4	365.3	337.8	326.6	285.8
Silk cocoons	151.5	147.4	156.1	172.9	169.8	177.5	177.0	188.2	184.1	182.1
Livestock change	1459.8	4462.3	2844.7	−6476.0	2541.7	4278.2	1696.9	−1043.1	−777.6	793.6
Gross livestock output	38809.8	42160.3	42597.6	34325.0	39041.1	46662.4	46950.3	47231.4	48643.6	50458.0
Net livestock output	31211.8	34086.2	34005.8	26262.6	31898.0	39083.3	37482.3	37753.0	38747.1	40126.6
Index (1970 = 100)	69.275	75.654	75.476	58.290	70.797	86.745	83.192	83.793	85.999	89.061
Annual growth (percent)	−5.55	9.21	−0.24	−22.77	21.46	21.53	−4.10	0.72	2.63	3.56
Total net farm output	**57993.1**	**62141.1**	**61312.0**	**50636.1**	**64623.8**	**69172.6**	**72337.3**	**72321.0**	**76591.9**	**74324.4**
Index (1970 = 100)	69.405	74.369	73.377	60.600	77.341	82.785	86.572	86.552	91.664	88.950
Annual growth (percent)	−1.19	7.15	−1.33	−17.41	27.62	7.04	4.57	−0.02	5.91	−2.96
Three-year moving average	59607.6	60482.0	58029.7	58857.3	61477.5	68711.2	71276.9	73750.1	74412.4	78157.9
Index (1970 = 100)	74.177	75.265	72.214	73.243	76.504	85.506	88.699	91.776	92.601	97.262
Annual growth (percent)	2.85	1.47	−4.05	1.43	4.45	11.77	3.73	3.47	0.90	5.03

Table A-1

Million rubles

USSR: Value of Net Agricultural Output, 1950-79 (continued)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Total grain	13657.2	13911.7	12956.9	16293.9	14383.2	10466.8	16450.8	14109.8	17966.9	13340.6
Food grains	8777.9	9228.5	7981.8	9663.8	7956.4	6241.8	9004.3	8021.5	11237.4	8284.8
Feed grains	4879.3	4683.2	4975.1	6630.1	6426.9	4225.0	7446.5	6088.4	6729.5	5055.8
Potatoes	9286.6	8852.8	7219.7	10598.3	7507.4	8398.4	8166.6	8005.6	8292.8	8860.1
Vegetables	3460.0	3399.4	3252.2	4227.6	4047.1	3808.7	4076.3	3938.9	4549.5	4437.2
Oil crops	1303.6	1218.5	1021.6	1517.8	1371.7	1121.6	1126.3	1229.1	1180.0	1149.3
Fruits, berries, nuts	3296.6	3470.6	2698.7	3765.0	3508.4	4014.3	4303.3	4307.5	4053.5	4597.4
Sugarbeets	1856.0	1672.6	1769.1	2022.8	1754.6	1608.9	2213.7	2206.6	2081.6	1801.8
Cotton	3823.9	3941.1	4049.3	4253.5	4667.0	4364.5	4594.3	4860.7	4717.5	5084.4
Tobacco	475.6	479.8	573.6	569.5	609.1	598.7	623.7	625.8	569.5	615.4
Makhorka	17.5	14.0	9.9	15.1	10.5	5.2	7.0	4.1	4.1	2.9
Fiber flax	1068.9	1139.2	1068.9	1038.4	942.3	1155.6	1193.1	1125.1	881.3	743.0
Tea	256.3	263.4	273.6	287.1	310.1	331.2	352.9	408.1	426.6	451.2
Total crops	**38502.2**	**38363.0**	**34893.5**	**44589.0**	**39111.3**	**35873.8**	**43108.0**	**40821.5**	**44723.3**	**41083.5**
Index (1970 = 100)	100.000	99.639	90.628	115.809	101.582	93.174	111.963	106.024	116.158	106.704
Annual growth (percent)	12.59	−0.36	−9.04	27.79	−12.28	−8.28	20.17	−5.30	9.56	−8.14
Meat	28797.7	31095.5	32150.8	31828.1	34402.8	35378.1	32390.0	34762.2	36557.3	36517.0
Milk	16271.1	16303.9	16303.5	17306.8	17985.0	17797.6	17576.3	18606.1	18556.7	18294.8
Eggs	4074.0	4510.0	4791.0	5115.4	5550.9	5736.7	5618.7	6119.4	6451.7	6558.5
Wool	1947.9	1993.9	1953.5	2014.8	2146.4	2169.7	2025.1	2134.3	2171.5	2194.8
Honey	336.0	315.2	294.4	353.6	318.9	310.4	300.8	332.8	286.4	302.4
Silk cocoons	171.9	187.2	211.1	203.5	197.4	199.4	230.0	219.8	237.1	239.7
Livestock change	4366.8	2341.6	−99.0	1974.6	1973.4	−2084.8	832.3	2803.2	1509.6	738.6
Gross livestock output	55965.3	56747.3	55605.3	58796.9	62574.7	59507.0	58973.2	64977.9	65770.4	64845.9
Net livestock output	45055.3	44830.7	43648.0	45495.3	50730.0	46141.8	45534.9	51932.3	51057.1	49114.9
Index (1970 = 100)	100.000	99.502	96.877	100.977	112.595	102.412	101.064	115.264	113.321	109.010
Annual growth (percent)	12.28	−0.50	−2.64	4.23	11.51	−9.04	−1.32	14.05	−1.69	−3.80
Total net farm output	**83557.4**	**83193.7**	**78541.6**	**90084.3**	**89841.3**	**82015.7**	**88642.9**	**92753.8**	**95780.4**	**90198.4**
Index (1970 = 100)	100.000	99.565	93.997	107.811	106.520	98.155	106.086	111.006	114.628	107.948
Annual growth (percent)	12.42	−0.44	−5.59	14.70	−0.27	−8.71	8.08	4.64	3.26	−5.83
Three-year moving average	80358.5	81764.2	83939.8	86155.7	87313.7	86833.3	87804.1	92392.4	92910.9	90731.8
Index (1970 = 100)	100.000	101.749	104.457	107.214	108.655	108.057	109.265	114.975	115.620	112.909
Annual growth (percent)	2.82	1.75	2.66	2.64	1.34	−0.55	1.12	5.23	0.56	−2.35

Table A-2

Thousand metric tons

Gross Output of Crops Used in CIA Index of Soviet Agricultural Output

	Prices [a]	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Wheat [b]	103.	31076.0	32400.0	43800.0	41276.0	42399.0	47289.0	67380.0	58113.0	76568.0	69101.0
Rye [b]	116.	17961.0	19400.0	15500.0	14514.0	15590.0	16475.0	14096.0	14467.0	15737.0	16902.0
Buckwheat [b]	306.	1329.0	1000.0	1200.0	762.0	935.0	1253.0	1285.0	769.0	664.0	381.0
Rice [b]	306.	202.0	200.0	200.0	222.0	222.0	246.0	250.0	211.0	216.0	214.0
Corn for grain [b]	138.	6644.0	4400.0	5700.0	3697.0	3699.0	11574.0	9861.0	4621.0	10226.0	5653.0
Oats [b]	82.	13005.0	10000.0	12900.0	10074.0	10799.0	11827.0	13218.0	12729.0	13407.0	13463.0
Barley [b]	81.	6354.0	6400.0	8200.0	7875.0	7764.0	10350.0	12903.0	8480.0	12957.0	10150.0
Millet [b]	81.	1705.0	3200.0	2500.0	2681.0	3013.0	2956.0	4556.0	1559.0	2880.0	1299.0
Pulses [b]	113.	2048.0	1300.0	1700.0	1122.0	923.0	1345.0	1018.0	1284.0	1577.0	1907.0
Other grain [b]	61.	876.0	400.0	500.0	264.0	224.0	372.0	384.0	406.0	490.0	468.0
Total grain		**81200.0**	**78700.0**	**92200.0**	**82487.0**	**85568.0**	**103687.0**	**124951.0**	**102639.0**	**134722.0**	**119538.0**
Potatoes [b]	114.	88612.0	58754.0	69189.0	72572.0	75021.0	71751.0	96015.0	87813.0	86527.0	86561.0
Beets	108.	589.0	548.0	596.0	683.0	703.0	818.0	815.0	827.0	818.0	798.0
Cabbage	95.	4364.0	4065.0	4427.0	5091.0	5244.0	6105.0	6091.0	6187.0	6139.0	5998.0
Carrots	153.	551.0	521.0	567.0	661.0	679.0	790.0	801.0	827.0	818.0	798.0
Cucumbers	212.	626.0	636.0	753.0	934.0	1037.0	1297.0	1401.0	1521.0	1605.0	1669.0
Onions	430.	533.0	530.0	606.0	740.0	799.0	987.0	1044.0	1107.0	1159.0	1182.0
Tomatoes	168.	2261.0	2138.0	2375.0	2756.0	2896.0	3440.0	3474.0	3588.0	3612.0	3605.0
Other vegetables	99.	420.0	398.0	450.0	524.0	560.0	663.0	672.0	709.0	714.0	724.0
Total vegetables	**163.**	**9344.0**	**8836.0**	**9774.0**	**11389.0**	**11918.0**	**14100.0**	**14298.0**	**14766.0**	**14865.0**	**14774.0**
Fruits, berries	282.	2850.0	2969.0	3088.0	3208.0	3510.0	3830.0	3440.0	4944.0	4846.0	4951.0
Sugarbeets	26.	19705.0	23377.0	21991.0	22891.0	19523.0	30664.0	31457.0	38535.0	51023.0	41369.0
Cotton	555.	3539.0	3727.0	3780.0	3853.0	4200.0	3881.0	4332.0	4211.0	4340.0	4645.0
Tobacco	2086.	59.0	66.0	73.0	81.0	93.0	81.0	79.0	102.0	100.0	112.0
Makhorka	582.	86.0	85.0	83.0	82.0	68.0	108.0	119.0	88.0	102.0	71.0
Sunflower seed [b]	187.	1654.2	1599.9	2028.6	2419.6	1756.3	3493.2	3631.2	2576.9	4255.9	2777.5
Soybeans	260.	166.0	145.0	142.0	172.0	56.0	151.0	114.0	162.0	229.0	224.0
Other oil crops	402.	316.0	316.0	443.0	308.0	209.0	302.0	359.0	257.0	295.0	167.0
Total oil crops	**203.**	**2136.2**	**2060.9**	**2613.6**	**2899.6**	**2021.3**	**3946.2**	**4104.2**	**2995.9**	**4779.9**	**3168.5**
Fiber flax	2344.	255.0	193.0	213.0	162.0	218.0	381.0	521.0	440.0	438.0	364.0
Tea	940.	84.9	94.9	97.7	110.0	110.2	121.0	110.0	112.4	138.2	145.7

Table A-2 Thousand metric tons

Gross Output of Crops Used in CIA Index of Soviet Agricultural Output (continued)

	Prices [a]	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Wheat [b]	103.	64299.0	66483.0	70778.0	49688.0	74399.0	59686.0	100499.0	77419.0	93393.0	79917.0
Rye [b]	116.	16357.0	16716.0	17024.0	11878.0	13619.0	16228.0	13146.0	12986.0	14120.0	10945.0
Buckwheat [b]	306.	639.0	867.0	871.0	498.0	714.0	950.0	935.0	1175.0	1472.0	1375.0
Rice [b]	306.	186.5	246.8	272.1	376.5	470.6	583.4	712.1	895.4	1063.2	1106.9
Corn for grain [b]	138.	9823.0	17113.0	15474.0	11143.0	13849.0	8030.0	8416.0	9163.0	8828.0	11954.0
Oats [b]	82.	11999.0	8900.0	5691.0	3965.0	5519.0	6186.0	9199.0	11581.0	11639.0	13070.0
Barley [b]	81.	16021.0	13338.0	19549.0	19804.0	28597.0	20304.0	27879.0	24662.0	28904.0	32652.0
Millet [b]	81.	3230.0	2887.0	2783.0	1835.0	3485.0	2205.0	3101.0	3218.0	2660.0	3289.0
Pulses [b]	113.	2706.0	4036.0	7579.0	8029.0	11110.0	6689.0	7031.0	6550.0	7212.0	7846.0
Other grain [b]	61.	229.5	203.2	161.9	275.5	308.4	279.6	265.9	237.6	248.8	247.1
Total grain		**125490.0**	**130790.0**	**140183.0**	**107492.0**	**152071.0**	**121141.0**	**171184.0**	**147887.0**	**169540.0**	**162402.0**
Potatoes [b]	114.	84374.0	84310.0	69677.0	71834.0	93642.0	88676.0	87853.0	95464.0	102184.0	91779.0
Beets	108.	878.0	711.0	688.0	697.0	895.0	917.0	1018.0	1006.0	1046.0	1125.0
Cabbage	95.	6613.0	6137.0	6140.0	5879.0	7125.0	6504.0	6054.0	7577.0	6369.0	6298.0
Carrots	153.	878.0	872.0	863.0	682.0	1129.0	987.0	964.0	1047.0	1103.0	1331.0
Cucumbers	212.	1956.0	1631.0	1487.0	1515.0	2219.0	1410.0	1750.0	2053.0	1787.0	1725.0
Onions	430.	1376.0	1421.0	1471.0	1000.0	1246.0	1639.0	1661.0	1417.0	1559.0	1575.0
Tomatoes	168.	4044.0	4587.0	4429.0	4294.0	5587.0	5129.0	5143.0	6078.0	5893.0	5436.0
Other vegetables	99.	829.0	792.0	911.0	984.0	1266.0	1041.0	1267.0	1356.0	1254.0	1255.0
Total vegetables	**163.**	**16574.0**	**16151.0**	**15989.0**	**15051.0**	**19467.0**	**17627.0**	**17857.0**	**20534.0**	**19011.0**	**18745.0**
Fruits, berries	282.	4942.0	5050.0	5978.0	6411.0	6866.0	8100.0	7805.0	8966.0	10621.0	9467.0
Sugarbeets	26.	52198.0	47742.0	43946.0	41455.0	76124.0	67500.0	69715.0	81579.0	84168.0	65283.0
Cotton	555.	4289.0	4518.0	4304.0	5210.0	5285.0	5662.0	5981.0	5970.0	5945.0	5708.0
Tobacco	2086.	103.0	100.0	102.0	122.0	184.0	169.0	178.0	215.0	215.0	195.0
Makhorka	582.	70.0	33.0	30.0	28.0	43.0	43.0	38.0	32.0	46.0	39.0
Sunflower seed [b]	187.	3649.6	4372.8	4411.4	3942.2	5573.4	5013.1	5658.0	6079.4	6150.2	5849.4
Soybeans	260.	167.0	336.0	392.0	448.0	286.0	421.0	590.0	548.0	531.0	437.0
Other oil crops	402.	176.0	251.0	187.0	187.0	296.0	200.0	300.0	284.0	284.0	145.0
Total oil crops	**203.**	**3992.6**	**4959.8**	**4990.4**	**4577.2**	**6155.4**	**5634.1**	**6548.0**	**6911.4**	**6965.2**	**6431.4**
Fiber flax	2344.	425.0	399.0	432.0	380.0	346.0	480.0	461.0	485.0	402.0	487.0
Tea	940.	163.7	161.6	178.9	195.6	193.7	197.0	238.2	234.4	229.0	244.6

Table A-2 Thousand metric tons

Gross Output of Crops Used in CIA Index of Soviet Agricultural Output (continued)

	Prices [a]	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Wheat [b]	103.	99734.0	98760.0	85993.0	109784.0	83913.0	66224.0	96882.0	92200.0	120820.0	90207.0
Rye [b]	116.	12972.0	12787.0	9633.0	10759.0	15223.0	9064.0	13991.0	8471.0	13607.0	8113.0
Buckwheat [b]	306.	1081.0	1170.0	811.0	1304.0	974.0	485.0	897.0	1038.0	985.0	836.0
Rice [b]	306.	1279.3	1429.5	1647.2	1765.0	1913.3	2009.3	2001.0	2220.0	2110.0	2394.0
Corn for grain [b]	138.	9428.0	8597.0	9830.0	13216.0	12104.0	7328.0	10138.0	10993.0	8951.0	8373.0
Oats [b]	82.	14203.0	14600.0	14100.0	17516.0	15302.0	12495.0	18113.0	18379.0	18600.0	15162.0
Barley [b]	81.	38200.0	34600.0	36800.0	55044.0	54208.0	35808.0	69539.0	52653.0	62077.0	47954.0
Millet [b]	81.	2100.0	2043.0	2123.0	4416.0	2907.0	1125.0	3198.0	2009.0	2210.0	1553.0
Pulses [b]	113.	7619.0	6948.0	7103.0	8447.0	8714.0	5321.0	8651.0	7477.0	7748.0	4343.0
Other grain [b]	61.	179.0	240.0	198.0	279.0	450.0	259.0	345.0	260.0	282.0	241.0
Total grain		**186795.3**	**181174.5**	**168238.2**	**222530.0**	**195708.3**	**140118.3**	**223755.0**	**195700.0**	**237390.0**	**179176.0**
Potatoes [b]	114.	96783.0	92655.0	78329.0	108200.0	81022.0	88703.0	85102.0	83652.0	86124.0	90956.0
Beets	108.	1188.0	1167.0	1117.0	1451.9	1389.0	1308.0	1400.0	1352.0	1563.0	1524.0
Cabbage	95.	7488.0	7356.0	7037.0	9147.0	8733.0	8243.0	8822.0	8525.0	9794.0	9552.0
Carrots	153.	1294.0	1271.0	1214.0	1576.4	1513.0	1424.0	1524.0	1473.0	1702.0	1660.0
Cucumbers	212.	2291.0	2250.0	2154.0	2800.1	2680.0	2522.0	2699.0	2608.0	3013.0	2939.0
Onions	430.	2015.0	1980.0	1892.0	2457.9	2357.0	2218.0	2374.0	2294.0	2651.0	2585.0
Tomatoes	168.	5558.0	5462.0	5231.0	6800.7	6500.0	6118.0	6548.0	6327.0	7282.0	7103.0
Other vegetables	99.	1378.0	1354.0	1296.0	1693.0	1639.0	1518.0	1624.0	1570.0	1897.0	1851.0
Total vegetables	**163.**	**21212.0**	**20840.0**	**19941.0**	**25927.0**	**24811.0**	**23351.0**	**24991.0**	**24149.0**	**27902.0**	**27215.0**
Fruits, berries	282.	11690.0	12307.0	9570.0	13351.0	12441.0	14235.0	15260.0	15275.0	14374.0	16303.0
Sugarbeets	26.	71385.0	64329.0	68043.0	77799.0	67484.0	61880.0	85142.0	84869.0	80061.0	69300.0
Cotton	555.	6890.0	7101.0	7296.0	7664.0	8409.0	7864.0	8278.0	8758.0	8500.0	9161.0
Tobacco	2086.	228.0	230.0	275.0	273.0	292.0	287.0	299.0	300.0	273.0	295.0
Makhorka	582.	30.0	24.0	17.0	26.0	18.0	9.0	12.0	7.0	7.0	5.0
Sunflower seed [b]	187.	5652.5	5210.0	4644.2	6794.2	6241.3	4590.8	4854.8	5431.7	4906.4	4980.9
Soybeans	260.	602.0	536.0	258.0	424.0	360.0	780.0	480.0	524.0	634.0	467.0
Other oil crops	402.	224.0	261.0	214.0	341.0	276.0	150.0	233.0	192.0	243.0	240.0
Total oil crops	**203.**	**6478.5**	**6007.0**	**5116.2**	**7559.2**	**6877.3**	**5520.8**	**5567.8**	**6147.7**	**5783.4**	**5687.9**
Fiber flax	2344.	456.0	486.0	456.0	443.0	402.0	493.0	509.0	480.0	376.0	317.0
Tea	940.	272.7	280.2	291.1	305.4	329.9	352.3	375.4	434.2	453.8	480.0

[a] 1970 average realized prices; rubles per metric ton.

[b] Gross output; includes seed, feed, and waste. See table A-1 for the value of net output.

Table A-3

Thousand metric tons

USSR: Output of Livestock Products and Livestock Inventories

Component	Prices a	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Meat											
Beef and veal	2454.	2355.0	2000.0	2200.0	2090.0	2091.0	2181.0	2348.0	2407.0	2715.0	3226.0
Pork	2252.	1478.0	1673.0	1813.0	2305.0	2715.0	2529.0	2666.0	3344.0	3264.0	3633.0
Mutton and kid	1824.	690.0	500.0	700.0	714.0	709.0	826.0	829.0	777.0	885.0	1063.0
Poultry	2368.	278.0	400.0	400.0	513.0	480.0	455.0	475.0	584.0	600.0	731.0
Other meat	3601.	66.0	98.0	57.0	200.0	286.0	333.0	280.0	262.0	236.0	263.0
Total	**2351.**	**4867.0**	**4671.0**	**5170.0**	**5822.0**	**6281.0**	**6324.0**	**6598.0**	**7374.0**	**7700.0**	**8916.0**
Other livestock products											
Milk	196.	35311.0	36200.0	35700.0	36475.0	38197.0	43009.0	49111.0	54750.0	58674.0	61716.0
Eggs (million eggs)	100.	11697.0	13300.0	14400.0	16059.0	17179.0	18481.0	19532.0	22269.0	23040.0	25594.0
Wool	4650.	179.6	192.0	219.0	234.8	230.0	255.8	261.1	288.9	321.8	356.4
Honey	1600.	182.0	190.0	199.0	208.0	207.0	206.0	206.0	230.0	208.0	210.0
Silk cocoons	5100.	24.8	25.2	25.6	25.9	26.5	24.4	28.1	23.9	28.3	29.6
Livestock inventories (1 January, thousand head)											
Cattle	442.	58100.0	57089.0	58800.0	56624.0	55837.0	56669.0	58793.0	61444.0	66766.0	70842.0
Hogs	173.	22200.0	24372.0	27100.0	28506.0	33318.0	30921.0	34003.0	40844.0	44336.0	48680.0
Sheep and goats	37.	93600.0	98953.0	107600.0	109930.0	115473.0	112971.0	116247.0	119812.0	130123.0	139175.0
Poultry (million birds)	5.	263.8	292.8	325.0	360.7	400.4	390.0	410.5	432.1	449.7	482.8

Component	Prices	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Meat											
Beef and veal	2454.	3252.0	2864.0	3277.0	3741.0	3571.0	3917.0	4377.0	5081.0	5513.0	5569.0
Pork	2252.	3276.0	3704.0	4011.0	4267.0	2813.0	4143.0	4465.0	4456.0	4079.0	4094.0
Mutton and kid	1824.	1019.0	1006.0	1062.0	1119.0	1052.0	1013.0	933.0	1028.0	1029.0	969.0
Poultry	2368.	766.0	813.0	822.0	802.0	606.0	696.0	745.0	764.0	817.0	866.0
Other meat	3601.	369.0	313.0	290.0	266.0	245.0	187.0	184.0	186.0	210.0	272.0
Total	**2351.**	**8682.0**	**8700.0**	**9462.0**	**10195.0**	**8287.0**	**9956.0**	**10704.0**	**11515.0**	**11648.0**	**11770.0**
Other livestock products											
Milk	196.	61718.0	62565.0	63931.0	61248.0	63262.0	72563.0	75992.0	79920.0	82295.0	81540.0
Eggs (million eggs)	100.	27464.0	29309.0	30089.0	28523.0	26694.0	29068.0	31672.0	33921.0	35679.0	37190.0
Wool	4650.	356.8	366.3	371.4	372.7	340.7	356.9	370.9	394.5	415.1	389.7
Honey	1600.	210.6	248.0	205.0	219.0	214.0	191.5	228.3	211.1	204.1	178.6
Silk cocoons	5100.	29.7	28.9	30.6	33.9	33.3	34.8	34.7	36.9	36.1	35.7

Table A-3

Thousand metric tons

USSR: Output of Livestock Products and Livestock Inventories (continued)

Component	Prices [a]	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Livestock inventories (1 January, thousand head)											
Cattle	442.	74233.0	75780.0	82077.0	86988.0	85448.0	87171.0	93436.0	97111.0	97167.0	95735.0
Hogs	173.	53443.0	58674.0	66702.0	69964.0	40858.0	52843.0	59576.0	58028.0	50867.0	49047.0
Sheep and goats	37.	143964.0	140304.0	144498.0	146410.0	139560.0	130674.0	135316.0	141042.0	144041.0	146141.0
Poultry (million birds)	5.	514.3	515.6	542.6	550.4	449.1	456.2	490.7	516.4	528.4	546.9

Component	Prices [a]	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Meat											
Beef and veal	2454.	5393.0	5536.0	5715.0	5873.0	6384.0	6400.0	6552.0	6888.0	7086.0	7029.0
Pork	2252.	4543.0	5277.0	5413.0	5081.0	5515.0	5600.0	4228.0	4950.0	5302.0	5289.0
Mutton and kid	1824.	1002.0	996.0	901.0	954.0	974.0	1000.0	878.0	894.0	921.0	870.0
Poultry	2368.	1071.0	1183.0	1203.0	1295.0	1420.0	1500.0	1414.0	1691.0	1902.0	2017.0
Other meat	3601.	269.0	280.0	401.0	324.0	327.0	468.0	511.0	299.0	290.0	276.0
Total	**2351.**	**12278.0**	**13272.0**	**13633.0**	**13527.0**	**14620.0**	**14968.0**	**13583.0**	**14722.0**	**15501.0**	**15481.0**
Other livestock products											
Milk	196.	83016.0	83183.0	83181.0	88300.0	91760.0	90804.0	89675.0	94929.0	94677.0	93341.0
Eggs (million eggs)	100.	40740.0	45100.0	47910.0	51154.0	55509.0	57367.0	56187.0	61194.0	64517.0	65585.0
Wool	4650.	418.9	423.8	420.1	433.3	461.6	466.6	435.5	459.0	467.0	472.0
Honey	1600.	210.0	197.0	184.0	221.0	199.3	194.0	188.0	208.0	179.0	189.0
Silk cocoons	5100.	33.7	36.7	41.4	39.9	38.7	39.1	45.1	43.1	46.0	47.0
Livestock inventories (1 January, thousand head)											
Cattle	442.	95162.0	99225.0	102434.0	104006.0	106266.0	109122.0	111034.0	110346.0	112690.0	114086.0
Hogs	173.	56055.0	67483.0	71434.0	66593.0	70032.0	72273.0	57899.0	63055.0	70511.0	73484.0
Sheep and goats	37.	135803.0	143421.0	145333.0	144690.0	148534.0	151232.0	147091.0	145373.0	146611.0	148104.0
Poultry (million birds)	5.	590.3	652.7	686.5	700.0	747.7	792.4	734.4	796.0	882.3	953.2

[a] 1970 average realized prices; rubles per metric ton.

Appendix B

USSR: Average Realized 1970 Prices of Agricultural Commodities

Grain

The average price received by all producers for all types of grain (103 rubles per ton) is calculated in CIA, *GNP 1970*, p. 32. Average realized prices for individual types of grain were estimated on the basis of the variation among procurement prices paid to collective farms for each grain in 1970 (table B-1). The ratio of collective farm procurement prices for individual grains to the overall grain price received by collective farms is applied to the average grain price received by all Soviet producers for all grain.

Potatoes

The average price received by all producers (114 rubles per ton) is reported in CIA, *GNP 1970*, p. 32.

Vegetables

The average price received by all producers (163 rubles per ton) is reported in CIA, *GNP 1970*, p. 32. The relationship between state procurement prices for all vegetables and for individual types of vegetables is used to estimate average prices received by all producers for each vegetable (table B-2).

Table B-1

USSR: Derivation of 1970 Average Realized Prices for Individual Types of Grain

	Prices Received by Collective Farms (rubles per ton)	Ratio of Prices for Individual Grains to Average Price for All Grain	Estimated Average Realized Price (rubles per ton)[e]
Total grain	**101**[a]	**1.00**	**103**
Wheat	101[b]	1.00	103
Rye	114[b]	1.13	116
Buckwheat	300[c]	2.97	306
Rice	300[d]	2.97	306
Corn	135[c]	1.34	138
Oats	81[b]	0.80	82
Barley	80[b]	0.79	81
Millet	80[b]	0.79	81
Pulses	111[c]	1.10	113
Other	60[d]	0.59	61

[a] *Vop ek*, no. 1, 1973, p. 57.

[b] Calculated on the basis of data expressing 1970 procurement prices as a percent of 1965 prices in A. I. Stepanov, *Khleb rossii*, Moscow, 1973, pp. 275-276 and V.P. Boyev, *Zernovoyye i maslichnyye kul'tury*, no. 7, 1969, p. 9.

[c] Actual 1971 procurement prices received by collective farms. Since the procurement price for wheat did not change between 1970 and 1971, the 1971 prices for other grains are assumed applicable. The 1971 prices are computed from data in V.P. Boyev, *Sovershenstvovaniye zakupochnykh tsen na sel'skokhozyaystvennuyu produktsiya*, Moscow, p. 156 and in A. Ye. Kaminsk, *Ekonomika zernovogo khozyaystvo*, Moscow, 1970, p.188.

[d] List procurement prices are reported in G. V. Kulik et al., *Spravochnik economista kolkhoza i sovkhoza*, Moscow, 1970, p. 298.

[e] Calculated by multiplying column 2 times 103 rubles per ton.

Table B-2

USSR: 1970 Average Realized Prices for Vegetables

	RSFSR Procurement Zone [a]	Share of Procurements (percent) [b]	Zone Procurement Price (rubles per ton) [c]	Weighted Average Procurement Price (rubles per ton) [d]	Ratio of Prices for Individual Vegetables to Average Price for All Vegetables (rubles per ton) [e]	Estimated Average Realized Prices (rubles per ton) [f]
All vegetables				106 [g]		163 [h]
Cabbage				61	0.58	95
	I	40	55			
	II	60	65			
Cucumbers				138	1.30	212
	I	60	120			
	II	40	165			
Tomatoes				109	1.03	168
	I	60	90			
	II	40	137			
Table beets				70	0.66	108
	I	40	70			
	II	60	70			
Carrots				100	0.94	153
	I	40	100			
	II	60	100			
Onions				280	2.64	430
	I	40	250			
	II	60	300			
Other						99 [i]

[a] RSFSR zone I and II procurement prices were selected as representative because the RSFSR supplied 43 percent of Soviet vegetable procurements in 1970. Within the RSFSR, Krasnodar Kray (zone I) and the remainder of the North Caucasus (zone II) are the largest vegetable suppliers.

[b] For cabbage, beets, carrots, and onions the price of zones I and II were weighted together by the respective shares of the two zones in total vegetable procurements in the North Caucasus in 1970. The share weights were reversed for tomotoes and cucumbers since the lowest procurement price is usually paid in the zone where procurements are largest.

[c] Prices for late, fresh varieties of the vegetable are from G.V. Kulik et al., *Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, pp. 329-335.

[d] Weighted average prices for individual vegetables are derived by applying the percentage shares of procurements to the zone procurement prices.

[e] Weighted average procurement prices for individual types of vegetables divided by 106 rubles per ton.

[f] Derived by multiplying ratios described in footnote (g) below by 163 rubles per ton.

[g] The overall USSR procurement price for all vegetables is derived by summing the ruble value of procurements from state farms, collective farms, and private producers. The total value is divided by total quantity procured to derive an overall weighted average price. Data on total values and quantities procured are from CIA, *GNP 1970*, p. 32.

[h] CIA, *GNP 1970*, p. 32. The aggregate vegetable price is derived independently from the prices for individual types of vegetables.

[i] "Other vegetables" are priced at the level needed to result in the overall price of 163 rubles per ton, using the prices for the six types of vegetables listed above.

Table B-3

Thousand tons

USSR: Quantities of Fruit Procured, 1970

	Total [a]	Private Producers [b]	State Farms	Collective Farms
Total	**6,180**	**872**	**3,170**	**2,138**
Grapes	3,145	255	1,494 (c)	1,396 (c)
Berries	49	20	1,676 (d)	742 (d)
Other fruit	2,986	597		

[a] Data for total fruit procurements and for procurements of grapes and other fruits are reported in *Narkhoz 1972*, p. 299. Berry procurements are derived as a residual by subtracting procurements of grapes and other fruit from total fruit procurements.

[b] G. M. Bogush et al., in *Sel'skoye khozyaystvo SSSR*, Moscow, 1972, p. 95, show percentage shares of total fruit procurements (6,180 thousand tons) that were obtained from private producers (14.1 percent). G. G. Badiryan, in *Ekonomika sotsialisticheskogo sel'skokhozyaystva*, Moscow, 1971, p. 377, presents data on procurements of berries from the private sector (40 percent) and for other fruits procured from the private sector (20 percent). Grape procurements from the private sector are derived as a residual by subtracting private procurements of berries and other fruit from total fruit procurements from the private sector.

[c] Total procurements of grapes from the socialized sector are allocated to state and collective farms according to their respective shares of fruit production. (Badiryan, *op. cit.*, p. 402).

[d] Includes berries and other fruits. Derived by subtracting procurements of grapes from total procurements of fruit from these producers.

Fruit

This category includes berries, grapes, other fruit, and nuts. The weighted average price (282 rubles per ton), however, is based on prices for berries, grapes and other fruit (table B-4). Average procurement prices are used because not enough data are available on fruit prices in collective farm markets, commission trade, and decentralized procurements to calculate average realized prices. The average procurement price is derived by weighting prices paid to collective farms, state farms, and private producers by the quantities obtained from each. Table B-3 shows quantities of fruit procured in 1970. Table B-4 shows the valuation of procurements and the derivation of the average procurement price.

Sugarbeets

Sugarbeets are priced at the 1970 price paid to collective farms for beets sold to state procurement organizations (26 rubles per ton). The 1970 price is from *Vop ek*, no. 1, 1973, p. 57.

Table B-4

USSR: 1970 Average Procurement Price for Fruit

Procurements	Quantities [a] (thousand tons)	Prices
Fruits and berries		
Deliveries of state farms and other state agricultural enterprises	1,676	276 [b]
Procured from collective farms	742	246 [c]
Delivered by private producers	617	246 [c]
Total or average	**3,035**	**263**
Grapes		
Deliveries of state farms and other state agricultural enterprises	1,494	315 [b]
Procured from collective farms	1,396	287 [c]
Delivered by private producers	255	287 [c]
Total or average	**3,145**	**300**
Total fruit		
Deliveries of state farms and other state agricultural enterprises	3,170	294 [b]
Procured from collective farms	2,138	273 [c]
Delivered by private producers	872	258 [c]
Total or average	**6,180**	**282**

[a] Table B-3

[b] State farm procurement prices are derived from an index for 1970 of fruit procurement prices (1966-100), *Ek selkhoz*, no. 7, 1972, p 33. The 1966 prices for fruits, and berries are calculated from Badiryan, *op. cit.*, p. 379, 389. For grapes, the 1965 price was used (*Vop ek*, no. 11, 1966, p.38). Because prices received by all farms per unit of delivered product were relatively unchanged from 1965 to 1970 (*Narkhoz 1979*, pp. 230, 260) little error is introduced.

[c] O. F. Lopatina and S.V. Frayer, *Ekonomika sotsialisticheskogo sel'skogo khozyaystva*, Moscow, 1973, p. 413. Collective farm procurement prices are assumed to be applicable to private producers.

Cotton

Procurement prices of state farms in 1970 (517 rubles per ton) and of collective farms (566 rubles per ton) are weighted with quantities sold to procurement organizations to obtain an average price of 555 rubles per ton. The collective farm procurement price is from *Vop ek*, no. 1, 1973, p. 57. The state farm price is calculated from data in *Ek selkhoz*, no. 7, 1972, p. 33, and in K.I. Pankova et al., *Ekonomiko-statisticheskoye izucheniye sovkhozov*, Moscow, 1969, p. 134.

Table B-5

USSR: Derivation of 1970 Average Prices for Other Oilseeds

	Quantity Produced (thousand tons)	Procurement (rubles per ton)	Value (thousand rubles)
Flax seed	113	245	27,685
Mustard seed	68	250	17,000
Castor beans	71	800	56,800
Other	9	375	3,375
Total	**261**	**402**	**104,860**

Flax fiber, tobacco, and makhorka

These commodities are priced at 1970 procurement prices received by collective farms. Data are from O.F. Lopatina and S.V. Frayer, *Ekonomika sotsialisticheskogo sel'skogo khozaystvo*, Moscow, 1973, p. 413.

Oil crops

The average price for all oil crops (203 rubles per ton) is the weighted sum of prices for individual crops.

Sunflower seed

The price (187 rubles per ton) is taken from CIA, *GNP 1970*, p. 32.

Soybeans

The price (260 rubles per ton) is the RSFSR list procurement price from G.V. Kulik et al., *Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, p. 301.

Other

This category includes flax seed, mustard seed, castor beans, and other minor oilseeds. All prices are RSFSR list procurement prices from Kulik et al., *op. cit.*, p. 301. Prices for flax seed, mustard seed, castor beans and other minor oilseeds are weighted together with 1971 production data from *Vest stat*, no. 10, 1974, p. 89. Other minor oilseeds include hemp seed, tung nuts, peanuts, falseflax, rape, colza, sesame, and others. The price (402 rubles per ton) is the weighted sum of RSFSR procurement prices for peanuts (600 rubles per ton), falseflax (135 rubles per ton) and rape (170 rubles per ton). Prices are weighted arbitrarily assuming a 50 percent share for peanuts, 25 percent for falseflax, and 25 percent for rape (table B-5).

Tea

Tea is valued at the actual procurement price received by state and collective farms in 1970 (940 rubles per ton). Data are from Ye.S. Karnaukhova et al., *Ekonomika sotsialisticheskogo sel'skogo khozyaystva*, Moscow, 1970, p. 418; and G.G. Badiryan, *op. cit.*, p. 394.

Meat, slaughter weight

The average realized price for all meat (2351 rubles per ton) is the weighted sum of prices for individual types of meat (table B-6). To calculate prices for slaughter weight quantities, the ruble value of liveweight marketings are divided by slaughter weight quantities. The underlying assumption is that the unusable portions (the weight difference between live weight and slaughter weight) are of zero value.

Milk, eggs, and wool

Average realized prices for milk, eggs, and wool are from CIA, *GNP 1970*, p. 32-34. Prices for milk (196 rubles per ton) and eggs (100 rubles per thousand units) apply both to production and to quantities used in production for feed (milk) and hatching eggs.

Honey

The price (1600 rubles per ton) is the RSFSR procurement price from G.V. Kulik et al, *Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, p. 383. RSFSR procurement prices were used because 70 percent of all honey originates in this region.

Silk cocoons

Almost half of silk cocoon procurements came from Uzbekistan in 1970. *Narkhoz Uzbekskoy SSR 1971*, pp. 103, 139-140 shows receipts of collective farms and of private producers from state procurement of silk cocoons in 1970 as well as quantities sold. The average procurement price (5100 rubles per ton) is derived by dividing receipts by quantities sold.

Table B-6

Slaughter weight

USSR: Derivation of 1970 Average Realized Prices for Individual Types of Meat

	Value of Marketings (million rubles)[a]	Quantities Marketed (thousand tons)[b]	Average Price (rubles per ton)[c]
Total meat	**22,101.4**	**9,400**	**2,351**
Beef	11,083.4	4,517	2,454
Pork	7,433.0	3,300	2,252
Mutton	1,342.4	736	1,824
Poultry	1,551.3	655	2,368
Other	691.3	192	3,601

[a] CIA, *GNP 1970*, pp. 32-34

[b] Quantities of meat in slaughter weight are estimated by multiplying liveweight marketings by dressing percentages. Liveweight marketings from the various sales channels are from source a. above, Table A-1, columns C, D, J, and K. The dressing percentages are: beef - 58.3 percent; pork - 71.9 percent; mutton - 51.2 percent; poultry - 80.0 percent; other meat -50 percent. Dressing percentages for beef, pork, and mutton are from I.Ye. Mampel' and N. Ya. Rayskiy, *Spravochnik po priyemke i soderzhaniyu skota na myasokombinatakh*, Moscow, 1971, pp. 180-184. Dressing percentages for poultry and for other meat (rabbit) are from A.M. Shafran, *Tablitsy perescheta zhivogo skota v uboynyy i uboynogo zhivoy*, Moscow, 1967, p. 10.

[c]. Value of marketings divided by quantities sold.

Livestock inventories

Average realized prices per ton of meat, liveweight, are converted to a price per head basis using the weight of live animals sold to state procurement organizations. The conversion of rubles per ton of live weight to rubles per head is shown in table B-7.

Vegetables fed

Feed vegetables are priced at the estimated average realized price for cabbage (95 rubles per ton) which is believed to predominate in vegetables fed.

Potatoes fed

Feed potatoes are priced at the seasonally low procurement-supply price (63 rubles per ton) which is in effect from September through December. The price used applies to the RSFSR, Belorussia, and the Ukraine where 95 percent of potatoes are produced. Prices are reported in M.K. Vasunin and A.S. Davydov, *Gosudarstvennye zakupi kolkhoznoy produktsii*, Moscow, 1978, p. 85.

Table B-7

USSR: Derivation of 1970 Prices for Livestock Inventories

	Weight of Live Animal (tons per head)[a]	Price (rubles per ton)[b]	Price per Animal (rubles per head)[c]
Cattle	.309	1,431	442
Hogs	.107	1,620	173
Sheep and goats	.040	935	37
Poultry ([d])	.002	1,896	5

[a] *Selkhoz 1971*, p. 328.

[b] CIA, *GNP 1970*, pp. 32-34.

[c] Average weight times price per ton.

[d] Live weight per bird is an average of weights for hens and broilers, ducks, geese, and turkeys (S. N. Alekseev, *Tovarovedeniye myasopromyshlennykh zhivotnykh, ptitsy, i produktov uboya*, Moscow, 1972, pp. 99-108). Average weight figures for hens and broilers, ducks, geese, and turkeys are incorporated into a single average weight figure for all poultry using a percentage distribution of mature birds in poultry flocks by type of bird for 1970 (A. V. Gromova et al., *Spravochnik: promyshlennoye ptitsevodstvo*, Moscow, 1971, p. 9).

Whole milk fed

Whole milk used for feed is priced at the 1970 average realized price described above.

Grain fed

For 1950-59 annual average prices for grain fed (table B-8) are estimated by weighting average realized grain prices (table B-1) with weights derived from grain production statistics. For buckwheat, corn, oats, barley, millet, pulses, and other grain, quantities used for seed and a deduction for waste are subtracted from gross output. The percentage distribution of the remaining net output is used to weight average realized prices. The major food grains, wheat and rye, as well as rice, are excluded from the calculation. For 1960-79, quantities of grain used for seed, food, industrial use, and export are subtracted from total supply of each grain (except rice) to derive a residual quantity available for feed.[117] Negative values that indicate deficits (such as for buckwheat) in 1974-77 are excluded from the calculation. The residual quantity of each grain is priced at the corresponding average realized price. The weighted average price for all feed grain varies for year to year according to the shifts in availability of each type of grain.

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[117] A (ER) 75-68.

Table B-8.

USSR: Derivation of 1970 Average Prices For Grain Fed

	Average Realized Prices (rubles per ton)	Percentage Distribution of Grain by Type														
		1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Wheat	103											15.3	20.5	27.7		36.1
Rye	116											8.0	6.2	2.3		2.4
Buckwheat	306	4.0	3.6	3.6	2.4	3.2	2.9	2.8	2.2	1.4	0.9	0.6	0.8	0.7	0.2	0.2
Corn	138	25.5	21.2	21.1	17.8	17.3	33.3	25.6	16.9	27.2	18.4	18.9	31.3	23.2	27.9	13.9
Oats	82	38.2	32.0	35.9	34.6	36.6	26.8	28.0	41.8	29.0	39.2	20.5	14.8	8.1	8.5	5.1
Barley	81	18.1	23.5	24.3	29.4	27.0	25.3	28.8	27.9	30.9	30.4	26.7	17.0	26.0	44.0	27.8
Millet	81	6.2	15.2	9.0	12.6	13.7	8.2	12.3	6.1	7.9	4.6	5.8	3.9	2.5	2.7	2.5
Pulses	113	4.9	3.0	4.5	2.8	1.5	2.6	1.4	3.5	3.0	4.8	3.6	4.8	9.4	16.2	11.7
Other	61	3.1	1.5	1.7	0.3	0.8	0.8	1.0	1.6	0.7	1.8	0.6	0.7	0.1	0.5	0.2
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Average price (rubles per ton)		106	102	103	98	99	107	102	97	101	95	101	109	106	103	102
		1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Wheat	103	21.1	52.6	27.6	38.7	22.2	37.6	37.3	31.9	39.6	19.0	18.3	28.1	29.9	40.5	32.6
Rye	116	12.4	1.0	1.6	4.0	0.5	2.4	2.1		0.7	5.3		2.7		2.7	
Buckwheat	306	1.1	0.4	1.0	0.9	0.7	0.2	0.3		0.2						
Corn	138	12.7	7.0	12.3	8.7	14.4	7.8	8.6	13.2	10.8	12.3	17.4	12.7	11.7	12.0	18.7
Oats	82	10.6	7.9	15.8	11.8	15.2	12.3	13.9	12.9	9.9	12.0	15.8	10.0	14.2	9.5	11.0
Barley	81	28.8	23.4	30.2	27.0	35.6	32.4	30.8	35.0	32.2	42.9	42.8	40.8	38.7	31.4	35.3
Millet	81	2.2	2.1	3.1	1.7	2.9	0.9	0.8	1.0	2.0	1.4		0.9	0.2	0.2	
Pulses	113	10.7	5.5	8.3	6.9	8.3	6.3	5.9	5.9	4.4	6.6	5.4	4.5	5.1	3.6	2.3
Other	61	0.4	0.1	0.1	0.3	0.1	0.2	0.2	0.2	0.2	0.4	0.3	0.2	0.2	0.1	0.1
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Average price (rubles per ton)		103	100	100	100	99	97	97	98	98	96	97	97	96	99	100

Appendix C

USSR: Intrasector Use of Agricultural Output

A. Estimates of Grain and Potatoes Used for Seed

Sown Area. Quantities of grain and potatoes needed for seed are derived by multiplying estimated seeding rates by sown area. Table C-1 shows the area sown to grain and potatoes in 1950-79. Except for winter wheat, winter rye, and winter barley, sown area statistics for grain and potatoes are taken from official Soviet handbooks as follows:

1979 *Vest stat*, no. 10, p. 74; *Narkhoz 1979*, pp. 244-245.

1978: *Narkhoz 1978*, pp. 218-219.

1977: *Narkhoz 1977*, pp. 226-227.

1976 *Vest stat*, no. 3, 1978, p. 83.

1965, 1970-75: *Narkhoz 1975*, pp. 347, 353-355. See also *Selkhoz 1971*, pp. 120-123; *Vest stat*, no. 4, 1977, p. 84; *Vest stat*, no. 5, 1976, p. 86; *Vest stat*, no. 5, 1975, p. 92; *Vest stat*, no. 10, 1974, p. 87.

1960, 1966-69: *Selkhoz 1971*, pp. 109-111, 116-123, 127, 133.

1963-64: *Narkhoz 1965*, pp. 284, 296-297, 299-301, 305; and *Selkhoz 1971*, p. 109.

1961-62: *Narkhoz 1962*, pp. 258-260; *Selkhoz 1971*, pp. 108-109; *Narkhoz 1964*, p. 284.

1950, 1953-59: *Selkhoz 1960*, pp. 132-133, presents data for all crops except spring rye. Area sown to corn for silage and green fodder was derived by subtracting the area for fully ripe corn from total area sown to corn. Spring rye data are from *Posevnyye ploshchadi SSSR*, vol. 1, Moscow, 1957, p. 7. An arbitrary estimate of spring rye production was added to official statistics for winter rye production in 1957 and 1959.

1951-52: *Posevnyye ploshchadi SSSR*, vol. I, Moscow, 1957, pp. 7, 437, 453, 490, 495. See also volume II, p. 192. Figures for rice and corn for silage were interpolated.

Official Soviet statistics on area sown to grain actually measure the area occupied by sowings at the completion of spring planting. This definition is more nearly comparable to harvested area than to sown area. The official statistics understate total sown area by the number of hectares that were sown the previous fall but subsequently were lost to winterkill or used for early spring grazing. As a result, official statistics on area sown to winter wheat, winter rye and winter barley must be augmented by estimates of area sown in the fall but not occupied by winter grain at the completion of spring planting. Total area sown in the fall is estimated from information in the Soviet press. Reports of sown area are made at weekly intervals from September through late October.[118] Area sown as reported by the press is larger than that reported in the handbooks by the number of hectares winterkilled or used for early grazing. Table C-2 shows our estimates of area sown to winter grain after the adjustment for winterkill and early grazing.

Seeding rates. The quantity of grain used for seed is estimated by multiplying the sown area figures shown in table C-1 by seeding rates per hectare. Seeding rates for the USSR as a whole (table C-3) are weighted averages of seeding rates in each republic. Within republics, seeding rates were compiled for each oblast, and these seeding rates were weighted with 1965 sown area from Soviet statistical handbooks without the adjustment for area lost to winterkill and early grazing. The seeding rates are for sowings of first-class seed, which must meet the criteria of 99 percent purity and 95 percent viability. The seeding rate for potatoes of 19 centners per hectare is reported in S.A. Il'in, *Ekonomika proizvodstva kartofelya*, Moscow, 1963, pp. 3, 5.

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[118] For example, *Sel'skaya zhizn'*, 4 October 1979, reported that 37 million hectares had been sown to winter grain crops and that this area amounted to 89 percent of the planned sown area. A week later on 12 October, *Sel'skaya zhizn'* reported that 38.6 million hectares had been sown, 93 percent of plan.

Thousand hectares

Table C-1

USSR: Area Sown to Grain and Potatoes

Area sown to:	Seeding rate (c/ha.)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Winter wheat	2.20	13647	16890	18602	19351	17704	19872	16283	20172	19811	19023
Spring wheat	2.00	26044	27400	29100	30533	33611	42172	49121	50523	48447	45578
Rye	2.00	25926	25977	24758	22136	23172	20860	23338	19797	19567	18671
Buckwheat	1.00	2953	2700	2500	2653	2765	2761	2676	2450	1689	1318
Rice	2.40	139	139	138	137	136	142	148	113	106	96
Corn for grain	0.23	4829	4100	3900	3485	4293	6176	6604	3256	4402	3547
Oats	2.00	16152	17400	16600	15314	15871	14811	15063	14029	14832	14328
Barley	2.00	8607	8133	8640	9638	10728	9908	12040	9230	9771	9756
Millet	0.30	3767	3300	3500	4081	5453	7683	6369	3570	3729	2698
Pulses	2.30	3498	2954	2530	2433	2672	2087	2071	1945	2107	2535
Other	1.40	715	621	245	252	290	289	292	220	254	272
Corn for silage	0.35	0	0	0	0	0	11741	17327	15016	15323	18867
Total grain area		**106277**	**109614**	**110513**	**110013**	**116695**	**138502**	**151332**	**140321**	**140038**	**136689**
Potatoes	**19.00**	**8534**	**8449**	**8207**	**8307**	**8709**	**9091**	**9197**	**9778**	**9525**	**9540**

		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Winter wheat	2.20	15299	18865	19744	21847	22582	23784	23933	23955	23256	22176
Spring wheat	2.00	48338	45733	49283	48253	48883	50411	50155	47318	48259	52012
Rye	2.00	20610	18345	18444	20062	19965	19255	16180	15091	15024	14191
Buckwheat	1.00	1418	1891	2287	1824	1383	1794	1844	1723	1703	2043
Rice	2.40	95	100	100	100	200	217	248	281	312	328
Corn for grain	0.23	5086	7145	7005	6995	5114	3177	3229	3485	3350	4167
Oats	2.00	12842	11500	6900	5700	5700	6628	7162	8688	8998	9300
Barley	2.00	12422	13557	16378	21172	21964	20022	19669	19405	19714	22968
Millet	0.30	3783	3800	4299	3965	3549	3253	3252	3802	3050	3376
Pulses	2.30	3321	4345	7200	10830	10643	6759	5927	5460	5052	5187
Other	1.40	223	262	336	432	340	224	208	164	154	155
Corn for silage	0.35	23079	18511	30134	27187	22300	20227	19880	19560	19001	18462
Total grain area		**146516**	**144054**	**162110**	**168367**	**162623**	**155751**	**151687**	**148932**	**147873**	**154365**
Potatoes	**19.00**	**9144**	**8900**	**8700**	**8500**	**8500**	**8612**	**8392**	**8331**	**8301**	**8100**

		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Winter wheat	2.20	23100	23717	21441	19361	24270	23820	23594	27674	27636	24370
Spring wheat	2.00	46725	43341	43513	44815	41066	42392	42219	41318	39776	38964
Rye	2.00	12503	10894	11681	7402	12794	9738	12359	8945	9226	8410
Buckwheat	1.00	1879	1768	1720	1648	1589	1459	1431	1743	1773	1662
Rice	2.40	350	390	421	462	495	500	524	546	580	610
Corn for grain	0.23	3353	3332	4012	4031	3955	2652	3303	3362	2535	3931
Oats	2.00	9250	9600	11400	11900	11500	12100	11296	13026	12097	12239
Barley	2.00	21619	21790	27786	29476	31535	32892	34691	35004	32969	38504
Millet	0.30	2691	2397	2724	2850	2970	2774	2998	3048	2924	2784
Pulses	2.30	5070	5178	5855	6083	5780	5670	5153	5195	5058	5508
Other	1.40	121	130	105	210	333	223	300	183	191	200
Corn for silage	0.35	18010	17800	17900	16900	17100	17300	18114	15557	16695	15469
Total grain area		**144671**	**140337**	**148558**	**145138**	**153387**	**151520**	**155982**	**155601**	**151460**	**152651**
Potatoes	**19.00**	**8064**	**7894**	**7894**	**8017**	**7983**	**7912**	**7087**	**7067**	**7042**	**6970**

Table C-2

Thousand hectares

USSR: Estimated Area Sown to Winter Grain

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Harvested area of winter grain [a]	36500	39900	40500	38461	36634	37992	31925	37363	37153	35843	29355	35667	37028	33356	37104
Wheat	12484	15600	17200	17823	15731	18285	12889	18535	18195	17419	12055	17267	18128	16356	19004
Rye	23592	23900	22800	20232	20475	19095	18395	18078	17899	17068	16200	16700	16900	15000	16700
Barley	424	400	500	406	428	612	641	750	1059	1356	1100	1700	2000	2000	1400
Area lost to winterkill and spring grazing [b]	3400	3300	3300	3300	4600	3300	8400	3300	3300	3300	7900	3300	3300	11200	7000
Wheat	1163	1290	1402	1528	1973	1587	3394	1637	1616	1604	3244	1598	1616	5491	3578
Rye	2196	1977	1858	1736	2572	1660	4838	1597	1590	1571	4360	1545	1506	5037	3158
Barley	41	33	40	36	55	53	168	66	94	125	296	157	178	672	264
Total sown area															
Winter wheat [c]	13647	16890	18602	19351	17704	19872	16283	20172	19811	19023	15299	18865	19744	21847	22582
Winter and spring rye	23730	24000	22900	20400	20600	19200	18500	18200	17977	17100	16250	16800	16938	15025	16807
Area lost	2196	1977	1858	1736	2572	1660	4838	1597	1590	1571	4360	1545	1506	5037	3158
Total rye	25926	25977	24758	22136	23172	20860	23338	19797	19567	18671	20610	18345	18444	20062	19965
Winter and spring barley	8566	8100	8600	9602	10673	9855	11872	9164	9679	9631	12126	13400	16200	20500	21700
Area lost	41	33	40	36	55	53	168	66	94	125	296	157	178	672	264
Total barley	8607	8133	8640	9638	10728	9908	12040	9230	9773	9756	12422	13557	16378	21172	21964

Thousand hectares

Table C-2

USSR: Estimated Area Sown to Winter Grain (continued)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Harvested area of winter grain [a]	37194	34863	33408	32772	24514	29805	31494	24339	26952	29920	29203	27453	28868	32271	26687
Wheat	19794	19803	19708	18972	14414	18505	20694	14979	18340	18610	19593	17248	20712	23122	18858
Rye	16000	13560	12400	12200	9200	10000	9500	8160	7012	9810	8010	9035	6697	7719	6499
Barley	1400	1500	1300	1600	900	1300	1300	1200	1600	1500	1600	1170	1459	1430	1330
Area lost to winterkill and and spring grazing [b]	7500	7000	7200	7400	13200	7400	4600	10500	1500	9100	6300	10100	9700	6300	7800
Wheat	3990	4130	4247	4284	7762	4595	3023	6462	1021	5660	4227	6346	6962	4514	5512
Rye	3225	2597	2673	2755	4954	2483	1387	3521	390	2984	1728	3324	2248	1507	1900
Barley	285	273	280	361	484	322	190	517	89	456	345	430	490	279	388
Total Sown Area															
Winter wheat [c]	23784	23933	23955	23256	22176	23100	23717	21441	19361	24270	23820	23594	27674	27636	24370
Winter and spring rye	16030	13583	12418	12269	9237	10020	9507	8160	7012	9810	8010	9035	6697	7719	6510
Area lost	3225	2597	2673	2755	4954	2483	1387	3521	390	2984	1728	3324	2248	1507	1900
Total rye	19255	16180	15091	15024	14191	12503	10894	11681	7402	12794	9738	12359	8945	9226	8410
Winter and spring barley	19737	19396	19125	19353	22484	21297	21600	27269	29387	31079	32547	34261	34514	32690	38116
Area lost	285	273	280	361	484	322	190	517	89	456	345	430	490	279	388
Total barley	20022	19669	19405	19714	22968	21619	21790	27786	29476	31535	32892	34691	35004	32969	38504

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[a] Official Soviet statistics. See the discussion for sources.

[b] Total area lost is allocated to wheat, rye, and barley according to the distribution of harvested area.

[c] Harvested area plus area lost.

The most complete data on grain seeding are available for oblasts of the RSFSR (G. V. Kulik et al., *Spravochnik ekonomista kolkhoza i sovkhoza*, Moscow, 1970, pp. 417-428). Data are also available for Belorussia (I. M. Kachuro et al., *Normativnye materialy po sel'skomu khozyaystvu*, Minsk, 1969, p. 46-50) and for Moldavia (F. Goryachenko, *Spravochnik ekonomista po planirovaniyu v kolkhozakh i sovkhozakh*, Kishinev, 1967, p. 189). Seeding rates for all other Soviet republics are estimated from these three sources. Seeding in nonchernozem oblasts of the Ukraine is estimated at the rate for Belorussia while the remaining Ukrainian oblasts are assumed comparable to Rostov oblast in the North Caucasus. Kokchetav and Northern Kazakhstan are equated with Omsk in Western Siberia; all other Kazakhstan oblasts are assumed seeded at rates for Orenburg in the Ural region. Belorussian seeding rates are applied to the Baltic republics. The Central Asian republics of Kirgizia, Tadzhikistan, Turkmenistan, and Uzbekistan are assumed comparable to the Kalmyk and Dagestan ASSRs. The Dagestan analog is also used for Azerbaydzhan, Armenia, and Georgia.

For pulse crops, a weighted seeding rate for each republic was derived by combining sown area with seeding rates for peas, kidney beans, lentils, other pulses, as well as vetch, lupin, and seradella for grain. Belorussian seeding rates for each pulse crop are assumed applicable to the Baltic republics; rates for Moldavia are available from Goryachenko, and all-RSFSR rates were used for remaining republics.

Corn for silage and green fodder is assumed sown in all republics at the midpoint of the range 30 to 40 kilograms per hectare, given as the all-USSR seeding rate in S.D. Kosaurov et al. *Normativnyy spravochnik sel'skokhozyaystvennogo proizvodstva*, Moscow, 1967, p. 17.

B. Agricultural Commodities Used for Feed

Grain. The basic data for grain fed in 1960-79 are derived from official Soviet statistics on quantities of concentrates fed. The methodology is explained in A (ER) 75-68, p. 33-34, which sets out the calculations for 1960-73. The data since 1970 have been revised slightly because data on extraction rates for flour—which changed the estimate of millfeed concentrates available—have been updated. The data for 1973-79 are presented in table C-4. To estimate grain fed during 1950-59, an index based on quantities of concentrates required annually to produce livestock products, to increase herd inventories, and to maintain horses was used. This synthetic index agrees generally with an index based on the official series of concentrates fed in later years. (See ER 79-10057, *USSR: Long-Term Outlook for Grain Imports*, January 1979, p. 13.) Because the requirements-based index is more consistent with what we believe occurred during the 1950s, we have chosen to use the requirements-based index to estimate quantities of grain fed during 1950-59, that is, the index was used to move the 1960 estimated quantity of grain fed (the base weight) back to 1950. Estimated quantities of grain fed are reduced by the same type of discount—based on weather conditions and crop size—used to discount grain production (see discussion on pp. 18-19, above.)

Potatoes. Data for potatoes fed are taken from official Soviet statistics for 1961-70, published in United States Department of Agriculture, Economic Research Service, Foreign 355, (undated), *Livestock Feed Balances for the USSR*, p. 20. For 1950-60 and 1971-79, quantities of potatoes fed are estimated from an independently constructed balance. We assume potatoes not used for seed, human consumption, and industrial uses are fed to livestock. Table C-6 presents the basic data from which the balance is derived. Table C-7 shows the estimated quantities of potatoes available for feed. The calculation is as follows:

$$Q = P_{(0)} - S_{(1)} - \frac{C_{(0)} + I_{(0)} + C_{(1)} + I_{(1)}}{2}$$

where Q = residual quantity available for feed

$P_{(0)}$ = production of current year

$S_{(1)}$ = seed required for crop of next year

$C_{(0)}$ = human consumption of current year

$I_{(0)}$ = industrial use of current year

$C_{(1)}$ = human consumption of next year

$I_{(1)}$ = industrial use of next year

Table C-3

Centners of first class seed per hectare

USSR: Seeding Rates for Grain, 1970

	Winter Wheat	Spring Wheat	Rye	Millet	Buckwheat	Corn for grain	Pulses	Rice	Oats	Barley	Other	Corn for silage and green fodder
USSR	2.2	2.0	2.0	0.3	1.0	0.23	2.3	2.4	2.0	2.0	1.4	0.35
RSFSR	2.4	2.1	2.0	0.3	1.1	0.26	2.3	2.4	2.1	2.1	1.1 [a]	0.35
Ukraine	2.2	1.9	1.8	0.3	0.9	0.22	2.4	2.8	1.5	2.0	0.1 [b]	0.35
Kazakhstan	1.6	1.9	1.5	0.3	0.9	0.27	2.1	2.4	1.5	1.8	1.0 [c]	0.35
Belorussia	2.3	2.5	2.0	0.3	1.0	0	2.0	0	2.2	2.1	2.1 [d]	0.35
Estonia	2.3	2.5	2.0	0.3	1.0	0	2.5	0	2.2	2.1	2.1 [d]	0.35
Latvia	2.3	2.5	2.0	0.3	1.0	0	2.5	0	2.2	2.1	2.1 [d]	0.35
Lithuania	2.3	2.5	2.0	0.3	1.0	0	2.0	0	2.2	2.1	2.1 [d]	0.35
Moldavia	1.8	1.9	1.5	0.3	0.9	0.23	2.4	0	1.6	1.4	0.1 [b]	0.35
Azerbaydzhan	2.3	2.1	1.8	0.3	0	0.25	1.0	2.4	1.7	2.0	1.0 [c]	0.35
Armenia	2.3	2.1	1.8	0.3	0	0.25	1.0	2.4	1.7	2.0	1.0 [c]	0.35
Georgia	2.3	2.1	1.8	0.3	0	0.25	1.6	2.4	1.7	2.0	1.0 [c]	0.35
Kirgiz	1.7	1.2	1.1	0.3	0	0.25	2.8	2.4	1.7	1.3	1.0 [c]	0.35
Tadzhikistan	1.7	1.2	1.1	0.3	0	0.25	1.7	2.4	1.7	1.3	0.1 [b]	0.35
Turkmenistan	1.7	1.2	1.1	0.3	0	0.25	0	2.4	1.7	1.3	0.1 [b]	0.35
Uzbekistan	1.7	1.2	1.1	0.3	0	0.25	1.9	2.4	1.7	1.3	0.1 [b]	0.35

[a] Assumed to be half sorghum for grain sown at the Moldavian rate and half a mixture of oats and barley sown at the rate of 2.1 centners per hectare.

[b] Assumed to be sorghum sown at the Moldavian rate.

[c] Arbitrary estimate.

[d] Assumed to be a mix of oats and barley. The weighted average seeding rate of Belorussia is used.

Table C-4 Million tons

USSR: Derivation of Grain Fed to Livestock

	1973	1974	1975	1976	1977	1978	1979
Total concentrates [a]	117.0	127.9	118.9	117.4	143.0	145.9	146.6
Grain [b]	99.10	109.62	101.23	99.44	121.91	124.70	125.07
Milling byproducts [c]	12.10	12.07	10.93	9.80	12.51	12.31	12.94
Oilseed meal							
Official [d]	NA	NA	3.14	3.48	3.63	3.31	3.19
Calculated [e]	3.73	3.42	3.55	3.58	[g]	[g]	[g]
Alfalfa meal [f]	2.07	2.79	3.60	4.68	4.95	5.58	5.40

[a] 1979: *Narkhoz* 1979, p. 284,
1975-78: *Narkhoz 1978*, p. 258,
1973-74: *Narkhoz 1975*, p. 412.

[b] Total concentrates less milling byproducts, oilseed meal, and alfalfa meal.

[c] Table C-5. According to *Ek selkhoz*, no. 4, 1971, p. 28, 92 percent of milling byproducts are used as feed.

[d] USDA, data supplied under the US-USSR Agriculture Agreement. *Maslo-zhiroyava promyshlennost'*, no. 2, 1980. *Vest stat*, no. 10, 1980, p. 79. According to *ibid*., 75 percent of total output of oilseed meal is used as feed.

[e] A (ER) 75-68, p. 33-34. The Food and Agriculture Organization of the United Nations, in a massive study, has also calculated the USSR's production of oilseed meals from 1965-75. See *A Survey of the Oilseeds, Oils, Fats, and Protein Meal Sector in the Union of Soviet Socialist Republic*, CCP:OF 7/C.R.S.1, March, 1977, p. 41. The FAO quantities of oilseed meal produced are higher than our calculations and also higher than the official statistics for the years in which both are available.

[f] Estimated at 90 percent of procurements as reported in the central press.

[g] Because the official data have again been made available to the United States through the US-USSR Agricultural Agreement, or have been published, calculating the quantities of oilseed meal available for feed use is no longer necessary.

NOTE: Components may not add to total because of rounding.

A comparison of the derived series with the official shows that it understates actual feed use in about half of the years for which the official data are available and overstates by roughly similar quantities in the other half. Thus, error in the series should be offsetting over time. No serious bias is introduced by the assumption that residual potatoes are fed. Nevertheless, data for years with drastic inconsistencies, such as 1950 and 1951 have been arbitrarily smoothed. Similarly, for those years when the residual is substantially larger than the usual quantity fed, such as 1973, the statistic has been arbitrarily reduced. Given the possible margin of error already present in the basic data from which the balance is derived , such adjustments do not seem unreasonable. Data for 1971 forward are rounded to millions because the underlying data for the balance, particularly for industrial use, are less certain than those for earlier years.

Vegetables. We assume that all vegetables not consumed by humans are fed to animals, that is, production plus imports less human consumption equals feed. Lack of data precludes adjustments for exports or inventory change. No vegetables are reported to have been exported. Inventory change data—available only in value terms for the retail trade system—groups vegetables with fruits and berries. Because the value of inventories has been fairly constant at 10 percent of retail sales of the same products it seems unlikely that lack of an inventory adjustment seriously biases the vegetables fed series over time. The series for vegetables fed is derived in table C-8.

In contrast to feeding of potatoes where some data are available, no data on total vegetables fed could be found. A few statements on quantities fed on state and collective farms or on collective farms alone were found. These quantities, ranging from 600 thousand tons in 1966 (*Plan khoz*., no. l, 1967, p. 25) to 3.1 million tons in 1973 (L.T. Dageev, *Podsobnyye promyshlenniye predpriyatiya v sel'skom khozyaystve*, Moscow, 1976, p. 14) were from half to two-thirds of the derived quantity assumed fed. Because the private sector produces nearly a third of total vegetables, it

Table C-5 Million tons

USSR: Derivation of Milling Byproducts Available for Livestock Feeding

	1973	1974	1975	1976	1977	1978	1979 (est.)
Total	**13.15**	**13.12**	**11.88**	**10.65**	**13.60**	**13.38**	**14.06**
Wheat flour [a]	9.89	9.78	8.82	7.74	10.31	10.07	10.66
Rye flour [a]	1.14	1.13	.85	.66	1.00	.98	1.03
Groats [b]	2.12	2.21	2.21	2.25	2.29	2.33	2.37

[a] The difference between quantity of flour produced and the quantity of grain required to produce the flour. Data for flour production for 1973-74 are from *Narkhoz 1975*, p. 297, for 1975-78 are from *Narkhoz 1978*, p. 184. The share of wheat flour was 83 percent of total flour in 1973-74, 84 percent in 1975-76, and 85 percent in 1977-78, the remainder is assumed rye flour. The amount of byproducts from production of flour other than wheat and rye is negligible. Extraction rates for wheat flour, for 1973-78 are assumed to be 78.3, 78.1, 80.0, 78.0, 78.0; for rye flour, 86.5, 86.3, 88.8, 91.0, 86.5. The assumptions are guided by official statements concerning changes in shares of *sortovaya* (graded) flours produced.

[b] The difference between the quantity of groats produced and the quantity of grain required. Data on production of groats are found in the following sources: 1973: *Mukomol'no-elevatornaya i kombikormovaya promyshlennost'*, no. 3, 1974, p.2; 1974: P.A. Lokshin, *Spros proizvodstvo torgovlya*, Moscow, 1975, p. 74. 1975, 1979: *Vest stat*, no 10, 1980, p. 79. 1976-78 are interpolated. The extraction rate for groats is 62.5 percent, the same as rice. The above sources do not always give total groats production; in those cases where the quantity produced above plan is the only indication of production, production for the current year is assumed to be production of the previous year plus the quantity produced above plan.

seems likely that private sector feeding of vegetables would be substantial and could be equal to socialized sector feeding in some years.

Whole milk. Quantities of whole milk fed to livestock are estimates based on incomplete data for most years. Official statistics for the total quantity of whole milk fed could be found for only one year, 1970. The series is derived in table C-10.

C. Eggs for Hatching

For the years 1953, 1957-60, and 1965-70, Soviet sources provide data on numbers of young poultry hatched in incubators. These data are used to calculate a poultry balance to estimate the number of birds expended per unit of poultry meat. These data, however, probably exclude eggs hatched in the private sector.

The ratios in table C-11 are arbitrarily interpolated and extrapolated to derive estimates of the number of birds expended and lost in other years. The ratios indicate that the average weight of poultry slaughtered for meat is dropping which is consistent with increasing emphasis on production of broiler meat. Previously, almost all poultry meat came from culled laying hens, which tend to be heavier than broilers.

We use an estimated hatching rate of 65 percent, which compares with 77 percent in the US in recent years.[119] No allowance has been made for changes in the hatching rate over time. The mortality rate for poultry used to increase flocks is estimated at 20 percent.[120] Table C12 shows estimates of hatching eggs for all years.

[119] Calculations of hatching rates for the US rely on data from USDA, Agricultural Statistics 1978, pp. 403 and 414. Chicks hatched by commercial hatcheries can be compared with statistics on eggs used for hatching. The implied hatching rate is 70-80 percent for 1975-77. The actual hatching rate may be higher since eggs used for hatching include eggs hatched on farms while the figures on chicks hatched are only for commercial hatcheries.

[120] Mortality rates for the US can be calculated from *ibid.*, p. 400. The number of chickens produced in the US is shown as the sum of the number raised minus the number lost. The mortality rate is about 15 to 20 percent. We assume this rate is valid for all types of poultry.

Table C-6 Million tons

USSR: Estimates of Elements of the Potato Balance

Year	Production [a]	Seed Use [b]	Industrial Use			Food [f]
			Alcohol [c]	Starch and Syrup [d]	Total [e]	
1950	88.612	16.214	2.240	(.400)	(2.640)	43.404
1951	58.754	16.000	1.690	(.400)	(2.090)	31.000
1952	69.189	15.601	1.329	(.400)	(1.729)	31.000
1953	72.572	15.783	1.453	(.500)	(1.953)	30.000
1954	75.021	16.547	1.360	(.500)	(1.860)	30.000
1955	71.751	17.273	1.232	(.600)	(1.832)	29.038
1956	96.015	17.474	1.561	(.600)	(2.161)	(29.556)
1957	87.813	18.578	2.277	(.700)	(2.977)	30.277
1958	86.527	18.098	NA	(.800)	(3.000)	31.020
1959	86.561	18.126	NA	NA	(3.000)	31.575
1960	84.374	17.374	.696	NA	(2.000)	30.645
1961	84.310	16.868	NA	NA	(2.000)	31.188
1962	69.677	16.503	NA	NA	(2.000)	31.481
1963	71.834	16.150	.690	NA	(2.000)	31.739
1964	93.642	16.184	1.634	NA	(3.000)	31.934
1965	88.676	16.362	2.599	1.560	4.159	32.788
1966	87.853	15.945	NA	(3.300)	3.300	31.522
1967	95.464	15.829	1.350	1.200	2.550	30.916
1968	102.184	15.772	2.688	(1.200)	3.888	31.217
1969	91.779	15.390	NA	NA	(3.600)	31.519
1970	96.783	15.322	2.072	(1.200)	(3.272)	31.564
1971	92.655	14.999	NA	NA	(3.200)	31.373
1972	78.329	15.124	NA	NA	(3.200)	29.948
1973	108.200	15.232	2.005	(1.300)	(3.305)	30.963
1974	81.022	15.168	NA	NA	(3.300)	30.504
1975	88.703	15.033	2.120	(1.300)	(3.420)	30.540
1976	85.102	13.465	NA	NA	(3.400)	30.559
1977	83.652	13.427	NA	NA	(3.500)	31.080
1978	86.124	13.380	(2.000)	1.600	(3.600)	30.572
1979	90.956	13.235	NA	NA	(3.600)	31.345

[a] Appendix A.

[b] Sown area times average seeding rate from table C-1.

[c] 1950, 1955, 1960, 1963-64: V.G. Pykov, *Ekonomika, organizatsiya, i planirovaniye spirtovogo proizvodstva*, Moscow, 1966, p. 26.
1951-54, 1956-57: V.P. Zotov, *Pishchevaya promyshalennost' sovetskogo soyuza*, Moscow, 1958, p. 111.
1965, 1968, 1970, 1973, 1975: M.T. Kochubeyeva, *Ekonomika organizatsiya, i planirovaniye spirtovogo i likerno-vodochnogo proizvodstva*, Moscow, 1977, p. 62.
1967: midpoint of range given in N.V. Vinogradov, (ed.), *Ekonomika pishchevoy promyshlennosti SSSR*, Moscow, 1968, p. 208.

[d] 1950-57: estimated.
1958, 1965: V.P. Zotov, (ed.), *Pishchevaya promyshlennost' SSSR*, Moscow, 1967, p. 360.
1967: N.V. Vinogradov, (ed.), *ibid.* Moscow, 1968, p. 208.
1978: *Sakharnaya promyshlennost'*, no. 10, 1978, p. 14.

[e] Sum of quantities of potatoes used for alcohol and starch and syrup. Missing years interpolated and indicated by parentheses.

[f] Mid-year population times officially reported per capita consumption from *Narkhoz 1979*, p. 432, and earlier editions.

Table C-7

Million tons

USSR: Potatoes Used for Feed (Crop Year)

Year	Available by Calculation [a]	Officially Reported [b]	Series in the Index [c]
1950	33.0		23.0
1951	10.2		20.2
1952	21.1		21.1
1953	24.1		24.1
1954	26.4		26.4
1955	23.0		23.0
1956	45.0		30.0
1957	36.1		36.1
1958	34.1		34.1
1959	35.6		35.6
1960	34.6	38.0	38.0
1961	34.5	39.3	39.3
1962	19.9	36.9	36.9
1963	21.3	32.6	32.6
1964	41.3	29.6	29.6
1965	36.8	36.1	36.1
1966	37.9	41.5	41.5
1967	45.4	38.8	38.8
1968	51.7	39.4	39.4
1969	41.5	37.6	37.6
1970	47.1	36.9	36.9
1971	43.7		43
1972	29.4		30
1973	59.0		45
1974	26.1		26
1975	35.3		35
1976	37.4		37
1977	35.9		36
1978	38.3		38
1979	42.8		42

[a] Based on data in table C-6, calculated as explained in text above.

[b] USDA, ERS Foreign 355, *Livestock Feed Balances for the USSR*, (undated), p. 20, converted to crop year use assuming 2/3 of quantity fed this year is from last year's crop and 1/3 is from this year's. The data are not available for 1950-59 or for 1971-79.

[c] With the exception of 1950-51, which are arbitrarily smoothed, and 1956, which is arbitrarily reduced in order to be more consistent with the given data, the residually-derived data for 1950-59 are accepted. Similarly, with the exception of 1973, which is reduced, the residually-derived data for 1971-79 are accepted.

Table C-8

Thousand tons

USSR: Derivation of Quantities of Vegetables Available for Feed

Year	Production [a]	Imports [b]	Consumption [c]	Available for Feed [d]
1950	9,344	47.9	9,185.1	206.8
1951	8,836	NA	NA	NA
1952	9,774	NA	NA	NA
1953	11,389	NA	NA	NA
1954	11,918	NA	NA	NA
1955	14,100	74.2	13,537.8	636.4
1956	14,298	56.4	12,980.5	1,373.9
1957	14,766	125.2	13,411.2	1,480.0
1958	14,865	151.1	14,682.8	333.3
1959	14,774	225.9	14,103.5	896.4
1960	16,574	240.9	15,001.0	1,813.9
1961	16,151	340.2	14,618.5	1,872.7
1962	15,989	350.1	14,851.0	1,488.1
1963	15,051	418.3	14,214.9	1,254.4
1964	19,467	565.1	16,879.4	3,152.7
1965	17,627	432.5	16,624.8	1,434.7
1966	17,857	521.2	17,045.5	1,332.7
1967	20,534	584.5	18,880.0	2,238.5
1968	19,011	551.9	18,825.7	737.2
1969	18,745	564.1	18,285.6	1,023.5
1970	21,212	612.0	19,909.6	1,914.4
1971	20,840	850.4	20,833.5	856.9
1972	19,941	965.8	19,800.0	1,106.8
1973	25,927	840.8	21,224.5	5,543.3
1974	24,811	865.8	21,932.7	3,744.1
1975	23,351	708.8	22,650.5	1,409.3
1976	24,991	816.3	22,084.8	3,722.5
1977	24,149	888.4	22,792.0	2,245.4
1978	23,902	889.9	24,039.6	752.3
1979	27,215	891.3	25,023.0	3,083.3

[a] Appendix table A-2.

[b] Appendix table C-9.

[c] Midyear population times officially reported per capita consumption from *Narkhoz 1979*, p. 432, and earlier editions.

[d] Production plus imports less human consumption. Theoretically, imports and consumption of vegetables should be lagged to balance with crop year production in order to derive a quantity of vegetables available for feed. To lag imports and consumption, we arbitrarily assumed each occurs evenly throughout the year. Quantities imported and quantities consumed in year t and year t + 1 were averaged. Although the resulting quantities available for feed were somewhat different from those shown above, the difference is so small in value terms that growth in the index of net value of output was changed by less than 0.1 percent in any year. Because the effect is so small, we did not lag imports and consumption.

Table C-9 Thousand tons

USSR: Imports of Vegetables

Year	Fresh Vegetables [a]	Canned Vegetables		Total [d]
		Pastes and Purees [b]	Converted to Fresh [c]	
1950	47.4	0.3	0.5	47.9
1955	64.3	6.0	9.9	74.2
1956	42.7	8.3	13.7	56.4
1957	95.8	17.8	29.4	125.2
1958	116.3	21.1	34.8	151.1
1959	168.0	35.1	57.9	225.9
1960	174.9	40.0	66.0	240.9
1961	189.9	91.1	150.3	340.2
1962	201.8	89.9	148.3	350.1
1963	239.6	108.3	178.7	418.3
1964	303.4	158.6	261.7	565.1
1965	222.0	127.6	210.5	432.5
1966	185.6	203.4	335.6	521.2
1967	151.0	262.7	433.5	584.5
1968	169.4	231.8	382.5	551.9
1969	182.0	231.6	382.1	564.1
1970	163.4	271.9	448.6	612.0
1971	310.0	327.5	540.4	850.4
1972	358.8	367.9	607.0	965.8
1973	235.6	366.8	605.2	840.8
1974	281.5	354.1	584.3	865.8
1975	144.0	342.3	564.8	708.8
1976	185.7	382.2	630.6	816.3
1977	190.5	423.0	697.9	888.4
1978	182.4	428.7	707.4	889.9
1979	147.1	451.0	744.2	891.3

[a] 1979: *Vneshnyaya torgovlya SSSR v 1979 g.*, (thereafter *Vnesh torg* and the year), p. 42.
1977-78: *Vnesh torg 1978*, pp. 41-42
1975-76: *Vnesh torg 1976*, p. 43.
1973-74: *Vnesh torg 1974*, p. 50.
1971-72: *Vnesh torg 1972*, p. 47.
1969-70: *Vnesh torg 1970*, p. 45.
1957-68: *Vnesh torg 1968*, pp. 45-56.
1950, 1955-66: *Vnesh torg 1918-1966*, pp. 111-113.

[b] Sum of number of cans of vegetables converted to tons and the quantity of pastes and purees, given in tons, from sources in (a) above. The number of cans of vegetables is converted to tons using the standard Soviet size, 400 grams per can. See, for example, *Vnesh torg 1972*, p. 47, which presents the data in both number of cans and thousand tons.

[c] Converted to quantities of vegetables required to produce the canned vegetables and pastes and purees using the coefficient, 1.65 tons of vegetables required to produce 1.00 tons of canned vegetables. See L.V. Opatskiy, *Razmeshcheniye pishchevoy promyshlennosti SSSR*, Moscow, 1958, p. 98.

[d] Sum of fresh vegetables and converted vegetables.

Table C-10

Million tons

USSR: Derivation of Whole Milk Fed to Livestock

Year	Total [a]	On Collective and State Farms [b]	Private
1950	4.6		
1951	4.7		
1952	4.6		
1953	4.7		
1954	5.0		
1955	5.6		
1956	6.4		
1957	7.1		
1958	7.6		
1959	8.0		
1960	8.0		
1961	8.1	5.2	2.9 [c]
1962	8.4	5.2	3.2 [d]
1963	8.0	4.8	3.2 [d]
1964	7.5	4.2	3.3 [d]
1965	8.7	5.1	3.6 [d]
1966	9.5	5.5	4.0 [d]
1967	10.2	5.9	4.3 [d]
1968	10.8	6.3	4.5 [d]
1969	11.1	6.6	4.5 [d]
1970	11.5 [e]	6.9	4.6 [d]
1971	11.4 [g]	6.7	4.7 [d]
1972	11.4 [g]	6.4	4.9 [f]
1973	11.4 [g]	6.5	4.7 [f]
1974	11.4 [g]	6.8	4.3 [f]
1975 Plan	10.9	7.0	
1975 Est.	11.4 [g]		
1976	11.4 [g]		
1977	11.4 [g]		
1978	11.4 [g]		
1979	11.4 [g]		

[a] 1950-60: assumed 13 percent of total milk production, the average share during 1961-70.
1961-1979: sum of milk fed on collective and state farms and milk fed to private livestock holdings unless otherwise noted.

[b] 1961-70: *Selkhoz 1971*, p. 332. 1971-73: *Nalichiye i raskhod v kolkhozakh i sovkhozakh v 1973 godu*, Moscow, 1974, p. 6.
1974-1975: *Sel'skaya zhizn'*, 14 September 1975, p. 2.

[c] P.A. Ignatovskiy, *Sotsialno-ekonomicheskiye izmeneniya v sovetskoy derevne*, Moscow, 1966, p. 383, notes that the private sector fed about 10 percent of its production at the beginning of the 1960s. Private sector production of milk in 1960 was 29.1 million tons and in 1961 was 28.5 million tons. (*Narkhoz 1978*, p. 249 and *Narkhoz 1922-72*, p. 258.)

[d] According to *Molochnaya promyshlennost'*, no. 1, 1972, p. 6, the private sector fed 15.9 percent of its production in 1971. The share of milk from private sector production being fed to livestock is assumed to increase by 0.54 percent per year during 1960-70 and by 0.5 percent in 1971 for a total increase of 5.9 percent (15.9 percent in 1971 less 10 percent in 1960). Private sector milk production for 1960-64 is from *Narkhoz 1965*, p. 376; for 1965-71 is from *Narkhoz 1975*, p. 396.

[e] *Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaystva SSSR na 1971-75 gody*, Moscow, 1972, p. 175.

[f] Total whole milk fed less whole milk fed on collective and state farms.

[g] *Plan khoz*, no. 11, 1979, p. 91, states that "In 1978 more than 12 percent of milk produced was used for (feed)." Because 12 percent of milk produced in 1978 (94.7 million tons) is 11.4 million tons, we assume the planned downturn in feeding of whole milk did not materialize, and hold the quantity fed constant from 1971 to 1979. (A small downturn probably occurred in the first year of a new five-year plan.)

Table C-11

USSR: Poultry Balance, Selected Years

	Poultry Flocks on 1 January (million)[a]	Young Poultry From Incubators (million)[b]	Birds Available (million)[c]	Poultry Flocks on 31 December (million)[a]	Birds Expended and Lost (million)[d]	Production of Poultry Meat (thousand tons)[e]	Ratio of Meat to Birds[f]
1953	(360.7)	306.2	666.9	400.4	266.5	513	1.925
1957	432.1	375.0	807.1	449.7	357.4	584	1.634
1958	449.7	433.9	883.6	482.8	400.8	600	1.497
1959	482.8	620.7	1103.5	514.3	589.2	731	1.241
1960	514.3	699.4	1213.7	515.6	698.1	766	1.097
1965	456.2	636.3	1092.5	490.7	601.8	696	1.157
1966	490.7	668.3	1159.0	516.4	642.6	745	1.159
1967	516.4	715.4	1231.8	528.4	703.4	764	1.086
1968	528.4	790.6	1319.0	546.9	772.1	817	1.058
1969	546.9	893.3	1440.2	590.3	849.9	866	1.019
1970	590.3	1184.7	1775.0	652.7	1122.3	1071	0.954

[a] Official statistics on poultry flocks are from *Narkhoz 1960*, p. 457; *Selkhoz 1960*, p. 320; *Selkhoz 1970*, p. 272.

[b] *Selkhoz 1960*, pp. 324-326; *Selkhoz 1971*, p. 275.

[c] Column 1 plus column 2.

[d] Column 3 less column 4.

[e] Table A-3.

[f] Column 6 divided by column 5.

Table C-12

USSR: Eggs Used for Hatching.

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Ratio of meat to birds [a]	(1.9)	(1.9)	(1.9)	1.9	(1.8)	(1.8)	(1.7)	1.6	1.5	1.2	1.1	(1.1)	(1.1)	(1.1)	(1.1)
Production of poultry meat (thousand tons) [b]	278	400	400	513	480	455	475	584	600	731	766	813	822	802	606
Birds expended and lost (million) [c]	146	210	210	270	266	253	279	365	400	609	696	739	747	729	551
Hatching eggs for meat birds (million) [d]	225	324	324	415	409	389	429	561	615	937	1071	1137	1149	1121	848
Change in poultry flocks (million) [e]	29	(32)	(36)	(40)	−10	20	22	12	33	32	1	27	8	−101	7
Hatching eggs for increase in poultry flocks (millions) [f]	56	(62)	(69)	(77)	−19	38	42	35	63	62	2	52	15	−194	13
Total hatching eggs (million) [g]	281	386	393	492	390	427	471	596	678	999	1073	1189	1164	927	861

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Ratio of meat to birds [a]	1.2	1.2	1.1	1.1	1.0	.95	(.95)	(.95)	(.95)	(.95)	(.95)	(.95)	(.95)	(.95)	(.95)
Production of poultry meat (thousand tons) [b]	696	745	764	817	866	1071	1183	1203	1295	1420	1500	1414	1691	1902	2017
Birds expended and lost (million) [c]	580	621	694	743	866	1127	1245	1266	1363	1495	1579	1488	1780	2002	2123
Hatching eggs for meat birds (million) [d]	892	955	1068	1143	1332	1734	1915	1948	2097	2300	2429	2289	2738	3080	3266
Change in poultry flocks (million) [e]	35	26	12	18	43	62	34	14	48	45	−58	62	86	71	34
Hatching eggs for increase in poultry flocks (million) [f]	67	50	23	35	83	119	65	27	92	86	−111	119	165	136	65
Total hatching eggs (million) [g]	959	1005	1091	1178	1415	1853	1980	1975	2189	2386	2318	2408	2903	3216	3331

[a] Table C-11; figures in parentheses are arbitrary estimates based on data in table C-11.

[b] Table A-3.

[c] Production of poultry meat divided by the ratio of meat to birds.

[d] Birds expended and lost divided by a hatching rate of 65 percent.

[e] Calculated from data in table A-3; additional data to complete the series are from *Narkhoz 1978*, p. 247; *Narkhoz 1975*, p. 395; *Narkhoz 1960*, p. 457.

[f] Changes in poultry flocks divided by the 65 percent hatching rate and by an 80 percent survival rate for young birds.

[g] Hatching eggs for meat birds plus those for changes in poultry flocks.

Part IV. AN INDEX OF CONSUMPTION IN THE USSR

By Gertrude E. Schroeder and M. Elizabeth Denton

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List of Standard Citations

Full Citation	Abbreviated Citation
USSR Central Statistical Administration, Statistical Handbooks	
Narodnoye khozyaystvo SSSR v 19—godu (National Economy of the USSR in 19—)	*Narkhoz 19—*
Promyshlennost' SSSR, 1964 (Industry USSR)	*Prom 1964*
Sel'skoye khozyaystvo SSSR, 1960, (Agriculture USSR)	*Selkhoz 1960*
Sel'skoye khozyaystvo SSSR, 1971, (Agriculture USSR)	*Selkhoz 1971*
Sovetskaya torgovlya (Soviet Trade), Moscow, 1964	*Sov torg 1964*
Gosudarstvennyy byudzhet SSSR i byudzhety soyuznykh respublik (State Budget of the USSR and Budgets of the Union Republics)	
1961-1965	*Gosbyudzhet, 1966*
1966-1970	*Gosbyudzhet, 1972*
1971-1975	*Gosbyudzhet, 1976*
Soviet Periodicals	
Voprosy ekonomiki (Problems of Economics)	*Vop ek*
Vestnik statisiki (Herald of Statistics)	*Vest stat*
Ekonomika i organizatsiya promyshlennogo proizvodstva (Economics and Organization of Industrial Production)	*EKO*
Ekonomicheskaya gazeta (Economic Gazette)	*Ekon gaz*
US Government Publications	
CIA, *USSR Gross National Product Accounts, 1970* A (ER) 75-76, November 1975	CIA, *GNP 1970*
CIA, *The Soviet Grain Balance, 1960-73*, A (ER) 75-68, September 1975	A (ER) 75-68
CIA, *A Comparison of Consumption in the USSR and the US, January 1964*	CIA, *A Comparison—*, 1964
Joint Economic Committee, Congress of the United States,	
Gross National Product of the USSR, 1950-80, 1982	JEC, *GNP, 1950-80*
An Index of Industrial Production in the USSR, 1982	JEC, *Industry*
An Index of Agricultural Production in the USSR, 1982	JEC, *Agriculture*
An Index of Consumption in the USSR, 1982	JEC, *Consumption*
Consumption in the USSR: An International Comparison, 1981	JEC, *Consumption Comparison*
Gross National Product of the USSR: An International Comparison, 1982	JEC, *GNP Comparison*
Soviet Economic Prospects for the Seventies, June 1973	JEC, *1973*
Soviet Economy in a New Perspective, October 1976	JEC, *1976*
Soviet Economy in a Time of Change, October 1979	JEC, *1979*
Other Publications	
Irving B. Kravis, Zoltan Kenessey, Alan Heston, and Robert Summers, *A System of International Comparisons of Gross Product and Purchasing Power*, United Nations International Comparisons Project, Phase I (Baltimore: The Johns Hopkins University Press, 1975)	ICP, Phase I
Irving B. Kravis, Alan Heston, and Robert Summers, *International Comparisons of Real Product and Purchasing Power*, United Nations International Comparison Project, Phase II (Baltimore: The Johns Hopkins University Press, 1978)	ICP, Phase II
Abraham S. Becker, *Soviet National Income, 1958-1964*, (Berkeley, University of California Press, 1969)	Becker, 1969
Abram Bergson, *The Real National Income of Soviet Russia Since 1928*, (Cambridge, Mass., Harvard University Press, 1961)	Bergson, 1961
Abram Bergson, *Productivity and the Social System: The USSR and the West*, (Cambridge, Mass., Harvard University Press, 1978)	Bergson, 1978
Vladimir G. Treml and John P. Hardt, eds., *Soviet Economic Statistics*, (Durham, N.C., Duke University Press, 1972)	Treml and Hardt

An Index of Consumption in the USSR

Introduction

The index of consumption described in this paper was developed to provide a measure of real consumption in the Soviet Union in the post-war period that is comparable in concept and methodology to measures available for Western countries. The index defines consumption to include all household expenditures on goods and services for consumption plus government current expenditures on health and education services. In Western national accounts—those of the OECD, for example—this definition is equivalent to "private final consumption expenditures" plus the health and education components of "government final consumption expenditures". Although treated separately here, the index is designed as a major component of an index of gross national product (GNP).[1] Like most of the other components of CIA's reconstruction of Soviet GNP over time, the consumption index is an aggregate of time series, most of them in physical units, weighted by expenditures in rubles in the base year (1970). This approach contrasts with that in Western countries, where the GNP index and its components are usually deflated value measures. In the Soviet case, the resort to physical measures was both necessary and desirable, because of the lack of trustworthy price indexes as well as current expenditure data in most cases.

A Western-type measure of progress in raising living standards in the USSR is required for two important reasons. First, the measures published by the Soviet government are conceptually unsuitable for comparisons with those published by Western countries and also are widely believed to have a large upward bias. The official Soviet measures—"real per capita incomes" and "personal consumption" plus "material expenditures of institutions serving the population"—are couched in the Marxian conceptual framework of net material product; thus, they exclude the labor inputs into personal and communal services, and they include depreciation and some other elements not considered to be final consumption expenditures in the West.[2] The Soviet government publishes neither a cost of living index, nor a suitable deflator for net material product by end use. The official index of retail prices has serious methodological and conceptual faults.[3]

Second, progress in raising living standards is a major facet of the challenge that Soviet-style socialism has long posed to Western market-oriented systems. The goal to "overtake and surpass" capitalist rivals was laid down by Stalin in the early 1930s and reiterated with great fanfare by Khrushchev in the early 1960s. Indeed, the Program of the 22nd Party Congress was design [illegible] oring Soviet society to communism "in the main" by 1980, when the Soviet people would have a "standard of living higher than that of any capitalist country."[4] Thus, provision of a reliable measure of real gains in living standards is key to an evaluation of the Soviet Union's progress toward its goal.[5] The CIA index is the only Western-type measure of consumption that has been constructed and kept up to date for the entire period since 1950. The results of its several recent versions have been published periodically in JEC compendia on the Soviet economy.[6] The index described in this paper is a somewhat revised version of that published in JEC, *1979*. Two other Western-type indexes are available for a part of the period—indexes for 1950-58 by Bergson and Chapman[7] and an index for 1958-64 by Becker.[8] These indexes have not been revised to take account of more recent information or extended to later years. The CIA index thus fills a large gap in Western research on trends in levels of living in the Soviet Union in the post-war years. The index is kept continuously under review, with a view to increasing its reliability as new information permits.

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[1] See JEC, *GNP, 1950-80*.

[2] For details, see United Nations, *Comparisons of the System of National Accounts and the System of Balances of the National Economy*, Part I, Series F, No. 20, New York (1977).

[3] Gertrude E. Schroeder, "An Appraisal of Soviet Wage and Income Statistics" and Morris Bornstein, "Soviet Price Statistics" in Treml and Hardt, pp. 307-312, 370-378.

[4] *Pravda*, October 19, 1961.

[5] The Soviet achievement is evaluated in a comparative framework in Gertrude E. Schroeder and Imogene Edwards, *Consumption in the USSR: An International Comparison*, US Congress, Joint Economic Committee, 1981.

[6] JEC, *1966*, Part II-B, pp. 499-529; JEC, *1973*, pp. 376-403; JEC, *1976*, pp. 620-660; JEC, *1979*, Vol. I, pp. 759-789.

[7] Janet G. Chapman, "Consumption," in Abram Bergson and Simon Kuznets, eds., *Economic Trends in the Soviet Union*, Cambridge, Harvard University Press, 1963, pp. 235-282.

[8] Abraham S. Becker, *Soviet National Income, 1958-1964*, RAND Berkeley, University of California Press, 1969, pp. 119, 222-227.

The following section provides a brief discussion of post-war trends in per capita consumption and changes in its structure. Then follows a general description and evaluation of the overall index of Soviet consumption and a comparison with official Soviet measures as well as the two measures developed by Western scholars for part of the period. A final section presents, describes and evaluates the component indexes for major categories of goods and services. Descriptions of indexes and weights and the documentation for their derivation are intentionally quite complete.

Consumption Trends and Patterns

Trends in Per Capita Consumption

The level of living of the Soviet people has improved rapidly during the past 30 years. During 1950-80, real consumption per capita nearly tripled, rising at an average annual rate of 3.5 percent (Table 1). Gains were much smaller in the 1970s than in the 1960s and 1950s, reflecting a slowdown in overall economic growth. While substantial, the growth rates for per capita consumption are well within the bounds of those found in Western countries in the postwar period, and Soviet living standards remain well below those in the United States, Japan, and most of Europe, both East and West.[9]

Over the period as a whole, per capita consumption of goods has risen faster than consumption of services, although this relationship was reversed in the 1970s. Among the three major goods categories, by far the fastest growth took place in consumption of durables, as the Soviet government sought to develop productive capabilities for consumer durables from very low levels. Soft goods, too, have been made available in rapidly growing quantities and improved quality and variety. Although quantitative gains in food supplies have been the slowest of the three goods categories, the quality of the diet has nonetheless improved greatly, shifting toward a pattern of less reliance on bread and potatoes and more reliance on meat and dairy products — a shift typical of other countries as per capita income levels rise. This shift toward a more modern dietary pattern slowed in the 1970s as a result of faltering agricultural progress.

Among the services, household services as a group grew considerably faster than communal services. Particularly rapid expansion occurred in the provision of transportation, communications, and utilities. In contrast, per capita availability of housing increased very slowly, with per capita living space in urban areas in 1980 still remaining below the minimum norm for health and decency set by the government in 1928. Repair and personal care services increased even more slowly than did housing until the latter half of the 1960s, when the government began a belated push to expand facilities for providing such services. Recreation services, measured mainly by movie and theater attendance, expanded rapidly during the 1950s but slowed sharply thereafter, reflecting the rapidly growing use of television and less organized forms of recreation.

In contrast to the pre-war period, provision of communal services per capita has increased much less rapidly than provision of goods and personal services. Health services have grown somewhat faster than education services over the period as a whole. Growth rates for both services have been quite uneven among 5-year periods, and there has been a pronounced slowdown in the expansion of both in the 1970s. Nonetheless, educational attainment of the population has risen substantially — from almost 5 years in 1950 to a little over 9 years in 1980.[10] Health services measured by the number of doctors and hospital beds per 10,000 population have more than doubled, although the quality of public health services may be seriously flawed, if one may judge from the significant increases in infant mortality rates in the past 10-15 years.[11]

The discussion thus far has referred to growth rates given by indexes aggregated with weights in established prices. As noted below, appreciably lower rates result, when component indexes are aggregated with factor cost weights. Differences occur in the growth rates for total consumption, goods, food, household services, and for services as a whole. When the concern is to indicate the expansion of real resources allocated to consumption, the indexes of consumption at factor cost are preferable. A summary comparison of growth rates for consumption and major categories measured in both sets of prices is given in Table 5 below.

Changes in the Structure of Consumption

The structure of consumption in the Soviet Union has been remarkably stable since 1950 (Table 2). Whether measured in established prices or at factor cost, the respective shares of goods and of services were about

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[9] For a detailed international comparison of relative levels and rates of growth of consumption see Gertrude E. Schroeder and Imogene Edwards, *op. cit.*

[10] CIA, *USSR: Trends and Prospects in Educational Attainment*, ER 79-10344, June 1979, pp 1, 23.

[11] Christopher Davis and Murray Feshbach, *Rising Infant Mortality in the USSR in the 1970s*, US Department of Commerce Bureau of the Census, International Population Reports, Series P-95, No. 74, June 1980.

Table 1

Average Annual Rates of Growth of Per Capita Consumption and Major Components in Established Prices, 1950-80

	1951-80	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80
Total	**3.5**	**4.5**	**4.0**	**2.4**	**5.1**	**2.9**	**2.2**
Goods	3.6	4.9	4.2	2.0	5.4	2.8	2.1
Food	2.6	3.4	3.3	1.8	4.3	1.6	1.0
Soft goods	4.8	8.4	5.5	1.9	7.1	3.0	3.1
Durables	9.3	17.4	10.5	3.9	9.1	10.0	5.3
Services	3.3	2.9	3.0	4.2	4.3	3.0	2.5
Household services	4.2	3.5	3.8	4.4	5.8	4.6	3.4
Housing	2.0	1.1	3.1	2.5	2.0	1.7	1.4
Utilities	5.2	4.1	4.7	7.8	5.7	5.3	3.8
Transportation	7.3	10.1	8.9	8.4	8.0	6.1	2.6
Communications	6.0	6.2	5.2	5.6	7.8	6.3	4.9
Repair and personal care	3.8	0.3	1.1	1.8	8.4	5.7	5.5
Recreation	2.4	7.1	3.0	2.2	1.6	0.6	0.3
Communal services	2.5	2.6	2.3	4.0	3.0	1.5	1.5
Education	2.4	1.5	1.5	5.2	2.9	1.5	1.7
Health	2.6	4.3	3.5	2.1	3.2	1.4	1.3

Table 2

(Percent)

Structure of Consumption in Established Prices and at Factor Cost, 1950, 1960, 1970, and 1980[a]

	1950		1960		1970		1980	
	Established Prices	Factor Cost	Established Prices	Factor Cost	Established Prices	Factor Cost	Established Prices	Factor Cost
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Goods	77.1	62.8	79.8	65.4	78.9	64.1	78.4	63.6
Food, beverages and tobacco	59.8	53.6	54.9	51.0	51.1	47.1	45.3	42.4
Soft goods	15.2	7.9	19.6	11.0	21.0	12.5	22.1	13.6
Durables	2.2	1.3	5.2	3.3	6.8	4.5	11.0	7.6
Services	22.9	37.2	20.2	34.6	21.1	35.9	21.6	36.4
Household	9.6	23.2	9.0	22.0	10.2	22.8	11.8	24.2
Housing	2.3	16.2	1.9	14.2	1.6	13.0	1.5	12.2
Utilities	1.2	1.1	1.2	1.2	1.6	1.8	2.0	2.2
Transportation	1.0	1.1	1.7	2.0	2.6	3.2	3.1	4.0
Communications	0.4	0.5	0.4	0.7	0.6	0.9	0.8	1.3
Repair and personal care	3.2	2.4	2.3	1.8	2.6	2.2	3.5	3.0
Recreation	1.4	1.7	1.5	2.0	1.2	1.8	1.0	1.5
Communal	13.3	14.0	11.2	12.6	10.9	13.1	9.8	12.2
Education	8.6	9.2	6.6	7.6	6.8	8.3	6.2	7.8
Health	4.7	4.8	4.6	5.0	4.1	4.8	3.6	4.4

[a] Derived from ruble values in 1970 prices. Because of rounding, components may not add to the totals shown.

the same in 1980 as they were in 1950. Essentially the same finding holds true when patterns are compared in current prices. Within the goods category, however, there has been a relatively slow decline (by international standards) in the share of food, beverages, and tobacco and a concomitant rise in the share of soft goods and especially durables.[12] This direction of change is to be expected from Engel's law concerning the relationship of expenditures on food to total consumption expenditures as incomes rise. Within the services, there has been a small increase in the role of personal services and a moderate drop in the role of communal services. The shares of transportation and communications have risen appreciably, while the share of housing has declined.

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[12] These matters are explored in more detail in a comparative framework in Schroeder and Edwards, *op. cit.*

Description and Evaluation of the Consumption Index

The Index in Established Prices

General

The index of total consumption—shown in summary form in Table 3 and in detail in Appendix A—is a weighted aggregate of separately constructed indexes for three broad categories of goods—food, soft goods, and durables and miscellaneous goods—six categories of personal services—housing, utilities, transportation, communications, repair and personal care, and recreation—and two communal services—education and health. The indexes for major categories, in turn, are weighted aggregates of varying numbers of component indexes.

The aggregate index is a sample index based to a considerable extent on time series in physical units. The sample is large and in one way or another represents more than 90 percent of all consumption expenditures. All important foods, soft goods, and durables are included, as are most personal services and all education and health services. Both the sample categories and the time series selected to represent them were severely constrained by the availability of published Soviet data. Ideally, one would like to have suitable and detailed expenditure time series and corresponding reliable price deflators. In general, the Soviet government publishes neither. Data on retail sales, regularly published in current prices with a disaggregation of several dozen groups, are flawed by the presence of sizeable residual groups of obscure content and by inclusion of sales to enterprises and sales of intermediate and investment goods that do not reflect household consumption. Retail sales data also include sales of so-called "productive" services, such as shoe repair. The data with which to remove or reclassify these various items are not available over time. Official retail price indexes are seriously defective, as already noted, since they reflect official price changes only on a fixed sample of basic products; the index is, in essence, an index of prices on an official price list and not an index of prices paid by consumers for goods actually available for purchase. The Soviet government publishes neither quantities nor values for consumption in kind, a major element in total food consumption. Neither expenditures nor price indexes are available for most personal services. Official data on government outlays for education and health are in current prices, and include transfer payments and some expenditures that belong to investment rather than to consumption.

In general, the Soviet Union publishes only a small fraction of the data that are required, ideally, to construct a reliable consumption index; moreover the definitions and methodologies underlying the published data are seldom available in more than cursory detail. As a result of these problems with the data, the quality of the components of the CIA indexes is uneven. Most satisfactory, perhaps, are those for food, soft goods, transportation, and communications; least satisfactory are those for durables and miscellaneous goods and for recreation. The indexes for housing and for communal services suffer from an inability to reflect improvements in quality; this shortcoming is not unique to the indexes constructed here for the USSR, however. Each of the major component indexes is evaluated below with respect to coverage and quality of the time series data and internal weights within major components.

Several sources of possible bias exist. The choice of 1970 as the base year may impart some bias to the index. In general, however, 1970 was a fairly "normal" year for consumers, in the sense that no major crop failure or other unusual event occurred. The matter of the degree of overall equilibrium in consumer goods markets is considered below. To test the effect of the choice of base year, alternative weights for major categories on a comparable basis were constructed for 1960 and 1976. Rates of growth shown by the three sets of weights do not differ much. The use of 1960 weights speeds up the index somewhat, while the use of 1976 weights instead of 1970 weights has a negligible impact on the index. Table 4 summarizes the growth rates given by alternative sets of weights for major categories.

The use of time series expressed in physical units may bias the index downward because of the inability to allow fully for improvements in quality. This source of bias could be significant, probably, only for footwear, hosiery, and knitwear and perhaps for education and health services. On the other hand, those series that

Table 3

Indexes of Total Consumption and Major Categories, Selected Years, 1950-80

	1970 Weights (Percent)	1950	1955	1960	1965	1970	1975	1980
Total Consumption	**100.0**	**33.8**	**45.9**	**60.9**	**74.0**	**100.0**	**120.7**	**140.4**
Goods	78.9	33.1	45.8	61.6	73.2	100.0	120.4	139.5
Food	51.1	39.5	50.9	65.5	77.2	100.0	113.6	124.5
Soft goods	21.0	24.5	39.8	57.0	67.4	100.0	121.5	147.7
Durables	6.8	10.8	26.3	47.3	61.6	100.0	168.9	227.9
Services	21.1	36.6	46.1	58.3	77.0	100.0	121.7	143.7
Household services	10.2	31.6	40.8	53.7	71.8	100.0	131.2	161.6
Housing	1.6	48.1	55.4	70.6	86.0	100.0	114.1	127.4
Utilities	1.6	25.1	33.4	45.9	72.1	100.0	135.7	170.4
Transportation	2.6	13.6	24.0	40.1	64.8	100.0	141.2	167.6
Communications	0.6	22.4	33.1	46.5	65.4	100.0	142.0	187.9
Repair and personal care	2.6	42.1	46.6	53.8	63.5	100.0	138.1	188.0
Recreation	1.2	37.6	57.6	73.0	87.7	100.0	108.0	114.3
Goods and household services	**89.1**	**32.9**	**45.3**	**60.7**	**73.1**	**100.0**	**121.6**	**142.1**
Communal services	**10.9**	**41.4**	**51.1**	**62.6**	**81.9**	**100.0**	**112.7**	**126.9**
Education	6.8	42.8	50.3	59.3	82.3	100.0	112.7	127.8
Health	4.1	39.0	52.5	68.0	81.3	100.0	112.6	125.2

Table 4

Growth Rates of Total Consumption and Major Categories, Alternative Base Year Weights in Established Prices

	1951-60			1961-70			1971-80		
	1960 Weights	1970 Weights	1976 Weights	1960 Weights	1970 Weights	1976 Weights	1960 Weights	1970 Weights	1976 Weights
Total consumption	**6.7**	**6.1**	**6.0**	**5.4**	**5.1**	**5.1**	**3.7**	**3.5**	**3.4**
Goods	7.2	6.4	6.4	5.3	5.0	5.0	3.6	3.4	3.3
Food	6.1	5.2	5.2	5.0	4.3	4.5	2.4	2.2	2.2
Soft goods	8.8	8.8	8.7	5.3	5.8	5.3	4.3	4.0	3.9
Durables	15.9	15.9	15.9	7.8	7.8	7.8	8.6	8.6	8.8
Services	4.9	4.8	4.7	5.8	5.6	5.5	4.0	3.7	3.6

are based on deflated retail sales or value of production in "constant" prices may impart an upward bias to the index, because of the dubious reliability of the official price indexes used as deflators. These two sources of bias tend to offset each other. Judging from a mass of anecdotal evidence from the Soviet press concerning the poor quality of consumer goods and hidden price inflation, however, one might conclude that the upward biases are predominant. There is no good way to assess the matter.

Category Weights

The expenditure weights used to aggregate the 11 major categories of goods and services are those for 1970 estimated in the calculations of GNP by end use in established prices. A full description of the sources and methods of their derivation is given in CIA, *GNP 1970*. The weights shown there have been revised considerably to take into account additional or more recent information and an improved understanding of Soviet data; the revisions are described in Appendix D of JEC, *GNP, 1950-80*. The revisions reduced total consumption by 4 percent and raised the share of goods as opposed to services. A summary description of the revised weights follows:

Goods. The weights for food and soft goods are the sum of (1) retail sales reduced to reflect only household purchases for consumption, (2) consumption in kind estimated in physical units valued at average prices realized by producers ("farm gate" prices) and (3) military subsistence estimated by valuing rations in 1970 prices. The weight for durables and miscellaneous goods represents retail sales reduced to reflect only household purchases for consumption.

Household services. The weights represent estimated household expenditures on these services based on a wide variety of Soviet sources, mainly studies by individual researchers published in books and journal articles.

Communal services. The weights are the sums of estimated expenditures for education and health (1) by households based on a variety of Soviet and other sources and (2) by the government, derived from official data on wages and employment and on budget expenditures for other items, net of investment outlays and stipends.

On the whole, the expenditure weights are considered to be quite reliable. Although nominal consumption may be overstated because of inability to remove some non-consumption expenditures from retail sales of goods and services, the total can be reconciled fairly well with official Soviet values for consumption. The total, of course, does not take into account black market prices and other activities carried on in the illegal "second" economy. Such activities are not included in GNP in other countries either. In the Soviet case, moreover, they probably generate mainly price increases and income transfers rather than additions to the supply of real goods and services.[13] As for individual category weights, which are based on specific Soviet sources and assumptions, their magnitudes generally are supported by other information that is available. Also, the revealed expenditure pattern agrees well with that given by official statistics based on family budget surveys (*Narkhoz 1977*, pp. 409-410), and, in general, with what one would expect on the basis of international comparisons for a country at the USSR's level of development as measured by per capita GNP and consumption.[14] Data from surveys of the family budgets of urban Jewish emigrees also support the relationships, when allowance is made for the unrepresentative composition of the sample.[15]

The 1970 weights used to aggregate the component indexes, both for major categories and for their subcategories, are probably about as accurate as can be obtained with the data base and understanding of its meaning that are available at present. Although a number of estimates and assumptions had to be made in the process of constructing these weights, the impact of any errors cannot be large. If anything, the values for consumption as a whole and for some categories are probably overstated, a tentative conclusion stemming from the fact that successive revisions in the weights, based on new information invariably produced lower values. The data underlying the weights for individual sub-categories are of uneven quality, a matter that will be considered in the following section.

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[13] Many personal services are provided privately, both legally and illegally. The expenditure weights for repair and personal care and health and education services include a substantial allowance for such services, based on a variety of information.

[14] Data on comparative expenditure patterns are given in Schroeder and Edwards, *op. cit.*; International Labour Office, *Household Income and Expenditure Statistics, No. 3, 1968-1976*, Geneva, 1979; V. Cao-Pinna and S. S. Shatalin, *Comparison Patterns in Eastern and Western Europe*, New York, Pergamon Press, 1979.

[15] Gur Ofer and Aaron Vinokur, *Private Sources of Income of the Soviet Urban Household*, RAND, R-2359-NA, August 1980, pp. 53-69.

Indexes

The indexes of total consumption and major components provide, it is believed, a reasonably reliable measure of the growth of real consumption in the USSR since 1950. Because the index is designed to measure as closely as possible real consumption of goods and services as measured in the West, this overall judgement lends confidence to international comparisons of relative progress in raising levels of living in the USSR and in other countries. The index is also a better indicator of the growth of consumption in the postwar period than are the Soviet official statistical series intended for that purpose, because the index is more inclusive and because it largely avoids the use of the unreliable official retail price indexes.

The index is considered much more reliable for depicting long-run trends than year-to-year changes. Inaccuracy in measuring the latter stems from the limitations of data availability. Absence of data for particular years necessitated interpolation in a number of cases, or resort to estimates based on a variety of evidence in other cases. Also, use of production data to represent some series may distort annual changes in actual consumption, especially for agricultural products; however, adjustments for inventory change and net foreign trade were made where available data permitted doing so.

The individual time series selected to measure consumption of particular categories of goods and services necessarily were constrained by the availability of data. Every effort was made to scour the literature and to select or construct data series that seemed most suitable as measures of changes in real consumption over time. Some series are based on measures of production or of consumption expressed in physical units (kilograms, square meters, kilowatt-hours and the like), others are based on deflated retail sales, while others are deflated government expenditures. The series are of uneven quality, a point that will be elaborated later for each major component index.

Indexes at Factor Cost and in Adjusted Market Prices

Factor Cost

As Bergson has shown,[9] measures of Soviet consumption in established prices (prevailing ruble prices) require modification to correct for distortions in Soviet prices, which fail to reflect either full resource costs (production potential) or consumers' marginal utilities as they would be expressed in a free market. Where the concern is with production potential (and perhaps also with welfare in terms of planners' preferences), ruble prices need to be adjusted (1) to remove turnover taxes, now levied mainly on soft goods, durables and alcoholic beverages; (2) to add subsidies, now applicable mainly to food and to housing; and (3) to allow for a resource charge for capital. A factor cost adjustment to 1970 ruble values has been made for GNP and its end-use components.[10] For consumption the procedure resulted in a net reduction in total consumption of 3.3 billion rubles, or 1.6 percent. Table 5 compares the growth rate of consumption and its major components aggregated (1) with established price weights and (2) with 1970 ruble factor cost weights. The factor cost weights reduce the growth of total consumption by about one-tenth for the period as a whole because the adjustment raises the weight of the relatively slow-growing housing component and reduces the weight of the fast-growing durables component. Also, the index of food, beverages, and tobacco grows more slowly when factor cost weights are used, because the factor cost adjustment raises the weight of the relatively slow-growing animal products sub-index and sharply reduces the weight of the very fast growing index of beverages. Meat prices are heavily subsidized, and alcoholic beverages are heavily taxed.

The adjustment reduces the share of consumption in GNP in 1970 from 55.1 percent to 54.2 percent. The effects on relative shares of major categories within consumption in 1970 are shown in Table 2.

Adjusted Market Prices

Bergson also considered the question of the extent to which relative prices in consumer goods markets in the USSR conform to his "consumer utility standard."[11] For retail prices to reflect relative utilities in the Soviet context, consumers must be free to dispose of money incomes as they choose and government price-fixing must succeed, by and large, in limiting demand to supply. Consumption in kind, in turn, should be valued at retail prices that reflect consumer utilities. Similarly, housing rents should reflect the levels that would obtain in an open market.

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[9] Bergson, 1961, pp. 103-126.

[10] For a description of the procedure, see JEC, *GNP, 1950-80*.

[11] Bergson, 1961, pp. 157-172.

Average Annual Percent

Table 5

Growth Rates of Total Consumption and Major Categories in Established Prices and at Factor Cost, Selected Years, 1950-80

	1951-60		1961-70		1971-80	
	Established Prices	Factor Cost	Established Prices	Factor Cost	Established Prices	Factor Cost
Total consumption	**6.1**	**5.3**	**5.1**	**4.5**	**3.5**	**3.1**
Goods	6.4	5.7	5.0	4.3	3.4	3.0
Food	5.2	4.8	4.3	3.7	2.2	2.0
Soft goods	8.8	8.8	5.8	5.8	4.0	4.0
Durables	15.9	15.9	7.8	7.8	8.6	8.6
Services	4.8	4.5	5.6	4.9	3.7	3.2

How did the situation in markets for consumer goods and services in 1970 conform to this theoretical standard? What adjustments in the 1970 established price weights would be needed, if they were to reflect relative utilities? We consider in turn, retail prices of goods, consumption in kind, and household services, including housing.

The overall market for consumer goods and services in 1970 probably was not seriously in disequilibrium. In that year, the average savings rate was a low 5.2 percent, although the marginal propensity to save jumped sharply.[19] This change probably reflected consumers' reaction to the expected (and actual) rapid increase in the number of new cars made available for purchase by the population. Cash is required for purchase of such high-priced durable goods, and people's expectations of being able to obtain one of these much desired items were greatly heightened. Clearly, however, there were numerous disequilibria in markets for individual goods and services — surpluses of some items, manifested in Spring clearance sales and price cuts and some "above norm" inventory accumulations — and shortages of other goods, reflected in sporadic queues and reported black markets.

With respect to products (mainly food) sold in both types of outlets, prices paid in ex-village collective farm markets (CFMs) exceeded the prices paid in state and cooperative retail outlets by an average of 59 percent. A part of that difference reflects the much superior quality of the products sold in CFMs. We might assume that half of the differential is a quality premium, leaving the rest to be accounted for by the inability to obtain the fresh foods involved in state stores. If the total quantity supplied were sold on a single market, the uniform price would be above the average state store price, but below the CFM average price adjusted for quality. Since the price and income elasticities of demand, as well as the individual prices and quantities of the products involved are not known, the equilibrium prices cannot be determined. If they were known, the relevant values used as weights in the index theoretically would need to be adjusted to reflect those prices. To provide an idea of the size of the adjustment, we assume that for the products involved (fresh foods) the average state price is 30 percent below the average CFM price, taking into account quality differences. Valuing state store sales at that price adds 5.6 billion rubles to consumption.

As Bergson notes, consumption in kind theoretically also should be valued at that "equilibrium" price — here assumed to be 30 percent above the state store level — less distribution and processing markups. In 1970, food subsidies paid by the state to food processors to compensate for the difference between procurement prices and retail prices for meat and milk amounted to some 11.9 billion rubles. The estimated gross subsidy per ton was 694 rubles for meat and 68.32 rubles for milk.[20] Household consumption in kind can be revalued at the subsidized prices after deducting processing and distribution costs estimated at 10 percent of those values. The results then need to be again revalued to reflect the assumed retail "equilibrium" price of 30 percent above the state price level. For products other than meat and milk, a rough allowance of 10 percent was made for processing and distribution costs of state procured products, and the average retail prices so estimated were then raised by 30 percent to bring them to the assumed "equilibrium" price. The final result is to reduce consumption in kind by 5.6 billion rubles (12.7 compared with 18.3). Military subsistence is assumed to be correctly valued in terms of the consumers utility standard, since the original prices are a combination of retail and CFM prices, more or less. The effects of the two hypothetical adjustments to 1970 valuations cancel out, leaving the value of the goods component of consumption unchanged.

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[19] *JEC 1979*, p. 766.

[20] Constance B. Krueger, *ACES Bulletin*, Fall, 1974, pp. 66-67.

Relative prices for housing and some household services in 1970 clearly did not correspond to the result that would have obtained in an open market. Urban housing was rationed and rents heavily subsidized; the basic rental rate was the same as in 1928. Prices for utilities, public transport, communications and other services also had remained fixed for many years. Following Bergson's approach, we revalue housing and household services in 1970, so that their price is related to that for goods in the ratio that prevailed in the United States in 1976. We use the ruble/dollar ratios given in the paper by Schroeder and Edwards. The result is to more than treble the value of these services, raising it from 21.6 billion rubles to 68.4 billion rubles. Education and health services, mainly government provided and valued at current cost, are re-valued at factor cost, thus increasing their level from 23.0 billion rubles to 27.2 billion rubles.

The impact of all these revaluations is shown below:

	Established Prices		Adjusted Prices	
	Billion Rubles	Percent	Billion Rubles	Percent
Goods	166.5	78.9	166.5	63.5
Household services	21.6	10.2	68.4	26.1
Education & health	23.0	10.9	27.2	10.4
Total	**211.1**	**100.0**	**262.0**	**100.0**

When the indexes are reweighted with adjusted price weights, the average annual growth of consumption during 1951-80 is 5.2 percent instead of 4.9 percent. The index is speeded up a little because of the much larger weights given to the most rapidly expanding categories — household services, most notably transportation, communications and utilities. The structure of Soviet consumption in adjusted prices more closely resembles that of developed market economies, such as Italy, than does the structure in established prices; in those prices, the ratio of goods to all services resembles that of India. It could be argued that in 1970 excess demand for housing was relatively much greater than that for household services; indeed, excess demand for such services as public transportation, communications and utilities was not especially evident (i.e., by queues and waiting lists). To consider the effect of this possibility, the above calculation was carried out with a revaluation only for housing among the household services. The result was to slow the index of total consumption somewhat — from an average annual growth of 4.9 percent to 4.5 percent during 1951-80.

Comparison With Other Indexes

Official Soviet Measures

As already noted, the Soviet government does not publish an index of real per capita consumption that can properly be compared with measures available for Western countries. For a number of years before 1976, the government published periodic data on total "personal consumption" and "material expenditures of institutions serving the population" in current rubles. The only published deflator related to final consumption is an index of retail prices in state and cooperative outlets. The index which shows almost no change in the price level since 1955, has been judged seriously unreliable. Indexes of collective farm market prices in the USSR as a whole have not been published since 1968, although an aggregate index can be calculated indirectly from regularly published data.

The Soviet consumption data refer to consumption as a component of national income (net material product), omitting labor in all services but including some depreciation on housing and on the capital stock in the services sector. For 1961-1975, the only period for which a comparable series in available, the Soviet measure of total consumption per capita deflated by

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Gertrude E. Schroeder and Imogene Edwards, *op. cit.*, p. 73.

See articles by Gertrude E. Schroeder and Morris Bornstein in Treml and Hardt, pp. 307-312, 370-376.

an index of official retail prices (including CFM prices) grows much more rapidly than the CIA index of real per capita consumption.

	Soviet Measures		CIA Index
	Current Prices	Constant Prices	Constant Prices
1960	100.0	100.0	100.0
1975	211.1	209.6	166.8
Average annual growth	5.1	5.1	3.5

The Soviet government also gauges progress in raising living standards by a regularly published statistical series labeled "real incomes of the population," expressed per capita. Although the exact nature of this published statistic is something of a puzzle[23] it apparently measures real per capita consumption of goods and material services.[24] As described in an official source, the calculation for each year: (1) begins with money incomes from all sources (2) deducts taxes, savings, change in bank loans and cash balances, and payments for services to arrive at money expenditures for the purchase of goods (3) adds incomes in kind, material expenditures (including depreciation) of institutions serving the population—transportation, health, education and others—payments for utilities, the value of cooperative housing constructed, and depreciation on state housing, and (4) deflates current values with an index of the prices of goods. In coverage, it differs from the CIA index of consumption, mainly by inclusion of cooperative housing, depreciation on housing and on the capital stock in services and by exclusion of labor services. As Table 6 shows, the official index grows much more rapidly than the CIA index—almost half again as fast for the period as a whole. The difference is greater in the 1970s than in earlier periods.

The reasons for the faster growth of the official index of real incomes are obscure. Neither the structure of that index in current values nor the deflator has been published. Why the official index increases more rapidly compared with the CIA index in some periods than in others also is not evident. Differences in coverage may be part of the explanation, for the CIA index includes personnel services in education, health and other services, which apparently grow more slowly than materials used in these sectors. The main reason however, seems to lie in the faulty price index used in the Soviet index to deflate current expenditures and imputed depreciation. The CIA index, in contrast, attempts to measure real quantities of goods and services consumed. Comparison of this index with an index in current prices provides an implied measure of price inflation.

Other Western Measures

Only two Western measures of Soviet real consumption are available for comparison with the CIA indexes—one calculated by Janet Chapman[25] for the period 1950-58 and one calculated by Abraham Becker[26] for the period 1958-64. The construction of both of these series begins with estimates of consumption constructed in current prices. The sub-categories of consumption are then deflated by price indexes of one kind or another. Both measures follow concepts and methodologies developed by Abram Bergson. The Chapman index for 1955-58 and the Becker index, in effect, employ Soviet official price deflators for goods purchased at retail prices. The Chapman index for 1951-55 uses Bergson's calculations for the period.[27] The implicit Bergson-Chapman deflator gives nearly the same rate of price change for the period as does a weighted index of official indexes of prices in state and cooperative stores and of prices on collective farm markets.[28] The Bergson-Chapman implicit price index for 1955 (1950 = 100) is 78.0;[29] the combined official price index is 77.6 or 76.7, with 1950 and 1955 weights, respectively.

With respect to the other components, matters are more complex. In general, the Bergson and Becker indexes (1) value consumption in kind, housing, and personal services in physical quantities in constant sets of prices (2) deflate the wage component of expenditures on health and education by an index of wages and (3) deflate nonlabor expenditures on health and education by composite deflators compiled from various sources (Bergson; Becker elected not to deflate such expenditures.) The Chapman index for 1956-58

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[23] Gertrude E. Schroeder in Treml and Hardt, pp. 304-307.

[24] The most complete description of how real incomes apparently are calculated is given in USSR Gosplan, *Metodicheskiye ukazaniya k razrabotke gosudarstvennogo plana razvitiya narodnogo khozyaystva SSSR*, Moscow, 1969, pp. 499-505. (Hereafter referred to as *Metodicheskiye ukazaniya*.)

[25] Janet G. Chapman, *loc. cit.*, in above.

[26] Abraham Becker, *loc. cit.*, in above.

[27] Bergson, 1961, pp. 307-308.

[28] *Narkhoz 1958*, pp. 699, 771, 787.

[29] Bergson, 1961, pp. 46, 85.

Table 6

Comparison of Official and CIA Measures of Soviet Per Capita Consumption

Indexes
(1950 = 100)

	Soviet Index of Real Incomes per Capita [a]	CIA Index of Real Per Capita Consumption [b]
1950	100	100
1955	142	125
1958	173	143
1960	187	151
1964	209	163
1965	223	171
1966	236	179
1967	252	189
1968	268	200
1969	281	210
1970	297	219
1971	310	226
1972	323	229
1973	339	236
1974	352	244
1975	368	252
1976	384	257
1977	397	263
1978	408	269
1979	419	276
1980	435	282

Average Annual Rates of Growth (Percent)

	Soviet Index	CIA Index
1951-55	7.3	4.5
1956-60	5.6	4.0
1961-65	3.6	2.4
1966-70	5.9	5.1
1971-75	4.4	2.9
1976-80	3.4	2.2
1951-60	6.5	4.2
1961-70	4.7	3.8
1971-80	3.9	2.5
1951-80	5.0	3.5

[a] The index was put together from indexes for various periods given in *Narkhoz* 1965, p. 593; *Narkhoz* 1967, p. 674; *Narkhoz* 1970, p. 537; *Narkhoz* 1975, p. 567; and *Narkhoz* 1980, p. 380.

[b] Table A-2. Growth rates were calculated from unrounded data.

is deflated variously by a cost of living index given in a Soviet source, the official index of state retail prices, and an index of the change in average wages.

Table 7 compares the rates of growth given by the Bergson, Chapman, and Becker indexes of total consumption with the rates shown by the CIA index. As can be observed, the CIA index increases more slowly than the other Western indexes in all of the periods compared. Many reasons could account for the divergence—somewhat different concepts, different treatment of some expenditure categories, data availabilities, and others. Since none of the indexes has been extended to recent years, there seems little point in trying to measure the impact of these factors. Probably the main reason for the differences is that the CIA index is largely an aggregation of physical measures of consumption weighted by expenditures in 1970 prices, while the other Western indexes employ earlier base-year weights and rely much more heavily on deflated value measures, with the deflators differing little from the official retail price indexes published by the Soviet government. Also, in constructing the CIA index, use could be made of a considerably larger body of data and information that has become available in the past 15-20 years.

Table 7

Average Annual Percentage Rates of Growth

Comparisons of CIA Index of Total Consumption With Indexes Constructed by Bergson, Chapman, and Becker

	1951-55	1956-58	1951-58	1959-64
CIA [a]	6.3	6.5	6.4	3.9
Bergson [b]	9.1 (8.1)			
Chapman [c]	7.9	7.4	7.7	
Becker [d]				5.3

[a] Table A-1.

[b] Consumption is valued at 1950 prevailing prices. (Bergson, 1961, pp. 85, 149) Figure in parenthesis reflects a valuation in 1950 ruble factor cost.

[c] Chapman, *loc. cit.*, pp. 238, 271. The index for 1951-55 is calculated in adjusted market prices of 1937, taken or derived from data in Bergson, 1961, pp. 128, 134, 165. The extension to 1958 is based on estimated values in current prices and various deflators. Sources are given in Chapman, *loc. cit.*, p. 272.

[d] Underlyng values are in 1958 established prices. Becker, 1969, p. 526.

Description and Evaluation of Component Indexes

Goods

The index of goods is the weighted sum of three category indexes—food, soft goods, and durables and miscellaneous goods. The weights are expenditures on the three categories in 1970, derived as explained in detail in CIA, *GNP 1970* and in Appendix D of JEC, *GNP 1950-80*. The weights for sub-indexes of the three major category indexes are consistent in concept and method of derivation with the major category weights. All weights are shown in ruble values or percentages in Appendix A, along with the indexes.

Food, Beverages, and Tobacco

Scope and Coverage. The category Food, Beverages and Tobacco comprises (1) household purchases of these items in state and cooperative retail outlets and in collective farm markets, including purchases in restaurants and canteens (2) household consumption in kind of food products, obtained mainly from private farming and (3) military subsistence. The concept coincides with the category "Food and Tobacco" in the personal consumption expenditures in US national accounts. Although the index is a sample index, it covers 94.4 percent of estimated total consumption of the relevant products. Only minor food items, such as salt, spices, and condiments, are not included; all important alcoholic and nonalcoholic beverages, except kvass and coffee, and all tobacco products are included.

The composite index is a weighted aggregate of 18 sub-indexes—15 for foods, two for beverages and one for tobacco. The weights for the sub-indexes represent expenditures in 1970 prices derived to be consistent in concept with the weights for the category as a whole. The weights for the sub-indexes are considered reasonably reliable. The sub-indexes are based on physical quantity series except for the indexes for macaroni and for tobacco, which represent deflated retail sales. Indexes and weights are shown in Appendix A, Table A-1; underlying data and sources are given in Appendix B.

Ten sub-indexes for food products, with 63 percent of the weight, are based on official data on per capita consumption of these products in kilograms or physical units. The consumption data, which have been published regularly since 1965, are based on a variety of sources, principally on balances of the supply and uses of agricultural products and on periodic family budget surveys. While the latter have been criticized for lack of representativeness, the results they give, according to Soviet statements, are checked against availabilities given by the product balances. Although the absolute levels in any one year must be used with great care in international comparisons (because of definitional problems), the data are considered reliable in trend. They are reasonably consistent with statistics for production, intermediate uses, changes in inventories, and net imports. The present approach to constructing the food index uses all of the per capita consumption series that are published and replaces an extremely complex methodology used earlier. That approach relied on production data, with numerous adjustments and estimates being required to fill in gaps in information. The physical consumption data are believed to provide an improved measure of year-to-year changes in consumption, compared with the production-based series.

Four sub-indexes for food products and the two sub-indexes for beverages with a total weight of 34 percent are based on physical production data, adjusted where possible for inventory change, net imports, and quality changes. Data availabilities constrained the extent of such adjustments. Such lacunae, along with gaps in the series of data on per capita consumption, reduce the reliability of the sub-indexes, especially with respect to year-to-year changes.

The two sub-indexes based on deflated retail sales (3 percent of the total weight) employ official retail price indexes as deflators; these indexes probably are not seriously in error for the two products concerned (macaroni and tobacco). They do take account of changes in quality and mix, however. Although such changes are not reflected in the series based on consumption in physical units, this failure is probably not too serious in the case of most food products.

The method of calculating the physical measures of per capita consumption is described in *Vest stat.* No. 2, 1968, pp. 46-50.

This methodology was used to construct the index that was published in JEC, *1976*, pp. 641-650 and in all versions published earlier.

Table 8

Derivation of 1970 Weights for Components of the Index of Food, Beverages, and Tobacco

	Retail Sales for Consumption [a] (Billion Rubles)	CFM Sales for Consumption [b] (Billion Rubles)	Military Subsistence (Billion Rubles)	Consumption in Kind [d] (Billion Rubles)	Total Consumption (Billion Rubles)	Total Consumption (Percent)
Total	**79.924**	**3.001**	**1.970**	**16.964**	**101.859**	**100.00**
Meat	11.793	1.024	.690	6.702	20.209	19.84
Fish	2.963		.110		3.073	3.02
Vegetable oil	.844		.058	.094	.996	.98
Margarine	.621				.621	.61
Milk	4.508	.293	.071	4.148	9.020	8.86
Butter	2.677		.121	.461	3.259	3.20
Cheese	.723				.723	.71
Eggs	1.573	.231	.165	1.679	3.648	3.58
Sugar	5.089		.080		5.169	5.07
Confectioneries	5.744				5.744	5.64
Tea	.580		.020		.600	.59
Flour and groats	9.295	.130	.377	.309	10.111	9.93
Macaroni	.534		.014		.548	.54
Potatoes	.718	.753	.072	2.490	4.033	3.96
Vegetables	2.486	.224	.072	.517	3.299	3.24
Fruit	3.130	.346	.120	.564	4.160	4.08
Alcoholic beverages and soft drinks	23.866				23.866	23.43
Tobacco	2.780				2.780	2.73

[a] Retail sales reported in *Narkhoz 1972*, pp. 584-585, minus purchases by state enterprises and institutions in small-scale wholesale trade (*melkiy opt*). Such purchases were deducted, based on their reported shares in 1968-1969 as given in *Vest stat*, No. 5, 1971, pp. 36-37. No attempt was made to distribute the deduction for business restaurant meals or the reported total value of the markup added to the costs of products sold in restaurants.

[b] Collective farm market purchases were distributed by product group on the basis of the following data: (1) a distribution of sales in all CFMs in 1957 (I. D. Ignatov, *Puti razvitiya kolkhoznoy torgovli*, Moscow, 1959, p. 15; (2) indexes of the physical volume of total CFM sales during 1958-68 (*Narkhoz 1959*, p. 708 and *Narkhoz 1968*, p. 654); (3) price indexes for 1958-68 compiled from those for all CFM sales during 1958-63 (*Narkhoz 1959*, p. 667, and *Narkhoz 1968*, p. 655); (4) ruble values for 1957 obtained from the shares given in Ignatov and a value of total sales given in *Narkhoz 1959*, p. 708; (5) extending these values to 1968 with current value indexes dervied from the indexes of physical volume and price; (6) assuming that the relative shares so obtained for 1968 held in 1970. Institutional purchases were deducted, based on information in *Vest stat*, No. 5, 1971, p. 39.

[c] CIA estimates based on information concerning the basic military food ration and its estimated costs.

[d] CIA, *GNP 1970*, pp. 32-35. A value for fruit was estimated using the methodology described there. The value for butter represents the milk equivalent of 104,000 tons of private production (*Narkhoz 1970*, p. 151) valued at average realized prices. Consumption in kind of sunflower seeds was allocated to vegetable oil.

Weights. The derivation of the 1970 weights for the sub-indexes is shown in Table 8. Essentially, the task was to disaggregate the components of the total weight—retail sales for consumption, collective farm market sales for consumption, military subsistence, and consumption in kind. The distribution of retail sales (the bulk of the total) could be made with considerable confidence, using published retail sales data and the assumption that the distribution of sales to enterprises and institutions was the same in 1970 as in 1968-69. Lack of data precluded allocation of the public catering markup, amounting to 2.4 percent of total retail sales of food and beverages. The distributions of CFM sales and military consumption are far less certain, but probably not grossly wrong. The distribution of consumption in kind is given by the methodology for estimating its total value and is thought to be reasonably accurate.

Indexes. The primary data underlying all of the sub-indexes are given in Appendix B. Ten sub-indexes are based on officially published data for per capita consumption expressed in kilograms or units; these data are converted to total consumption using mid-year population data. These sub-indexes are: meat, fish, vegetable oil, milk, eggs, sugar, flour and groats, potatoes, vegetables, and fruit. Consumption so obtained for milk was reduced by milk used to produce cheese and butter; consumption of sugar was reduced to remove sugar used to produce confectionery products; consumption of flour and groats was reduced to remove flour used in the production of confectioneries and macaroni. The basic data on per capita consumption are given for 1950, 1958, 1960, and 1964-65 in *Narkhoz 1965*, p. 597; for 1966-67 in *Narkhoz 1967*, p. 697; for each year 1968-80 similar data are published in the respective year's *Narkhoz* in similar tables. Data for the years 1951-57 and 1959 were interpolated on the basis of growth rates for production of each product over the intervening periods.

While the results for the period as a whole are reasonably consistent with production data, the rates of growth for 1951-55 and 1956-58 shown by the physical consumption data are subject to considerable and probably varying margins of error. Values for 1961-63 also were obtained by interpolation, by use of production data, or with data on the value of consumption in current rubles given in *Narkhoz 1964*, pp. 580-81. The data required to remove the milk, sugar, and flour used in making those products for which separate sub-indexes are calculated are found in various statistical handbooks and a variety of other Soviet sources, as are the data used to calculate indexes of quality change for confectionery products and for flour and groats.

Six of the component indexes are based on production in physical units: margarine, butter, cheese, confectioneries, tea, and alcoholic beverages and soft drinks. Where necessary and possible, the production data were adjusted to allow for net imports and net inventory change. The index for beverages is the sum of production in dekaliters of 7 products, combined with 1970 average price weights. Data on imports and exports are regularly published in the annual trade handbooks (*Vneshnaya torgovlya SSSR*). Data on wholesale and retail inventories were regularly published in two tables in the annual *Narkhozy* (e.g. *Narkhoz 1972*, pp. 591, 593) until 1976; the tables were dropped from the handbooks after 1975, thus introducing some inaccuracies in the indexes for subsequent years. The indexes for confectioneries and flour and groats incorporate indexes of quality to reflect changes in product mix. The indexes for tobacco and macaroni are based on deflated retail sales, using official Soviet retail price indexes.

Soft Goods

Scope and Coverage. The "soft goods" category comprises (1) household purchases of 16 categories of consumer nondurable goods that are explicitly listed in Soviet retail trade data, plus an estimated share of an unidentified residual in those data; (2) household purchases of similar goods in collective farm markets—a minor item; (3) military consumption of such goods; and (4) consumption in kind of wool. Over four-fifths of the weight for the category consists of clothing and footwear and related items. Although the index for soft goods is based on a sample, it covers 94 percent of the total estimated consumption of these goods in 1970. The only items separately listed in Soviet retail trade data that are not specifically included are fur products and matches. A variety of odds and ends that are included in residual (unidentified) retail sales are also excluded, however; the most important of these are medicines and gasoline.

The index for soft goods is a weighted aggregate of 16 sub-indexes. All but 5 of the 16 pertain to clothing and footwear (including fabrics). The weights for the sub-indexes were derived in a manner consistent with the derivation of the weight for the category as a whole. They are considered to be quite reliable. Seven of the indexes with 72 percent of the weight are based on production series, and the rest are based on deflated retail sales, using official retail price indexes. When possible, the indexes based on physical production data have been adjusted for net foreign trade and inventory change. Three of these indexes can be compared with indexes derived from official Soviet data on per capita consumption in physical units and with deflated retail sales. The comparisons are shown below (1950 = 100). The CIA indexes agree quite well with those based on Soviet data on per capita consumption.

	Knitwear			Hosiery			Leather Footwear		
	A	B	C	A	B	C	A	B	C
1960	314	274	443	224	204	358	206	206	315
1975	758	809	2,275	331	316	1,235	411	364	901

A Index derived from Soviet per capita consumption data in physical units, including imports
B CIA index
C Indexes derived from official deflated retail sales

But both indexes grow much less rapidly than those based on officially deflated retail sales. No doubt, the physically based measures understate the real growth of consumption of these items because they do not take account of improvements in quality and product assortment. On the other hand, deflated retail sales indexes surely overstate real growth, since the price deflators are known to have a downward bias. There is no way to determine the degree of bias independently because there are no suitable price data.

The index for clothing (sewn garments) with a third of the soft goods weight is based on official Soviet data on the value of production in so-called constant (1967) prices. It, too, increases much more slowly than the value of officially deflated retail sales: the respective indexes for 1975 (1950 = 100) are 608 and 1048. Both indexes, as well as the others discussed above, overstate real growth of consumption to some extent because they do not take into account the shift from home production to factory manufacture. Although both deflated value indexes (production and retail sales) are believed to have unreliable deflators, that for retail sales is considered the least accurate. The comments about the reliability of official retail price indexes apply also to the 6 sub-indexes that are based on deflated retail sales. There are no alternative data to use in estimating consumption of these items. Because of the familiar faults of official price indexes, the indexes probably have an upward bias. One can hope, but not be certain that the various biases more or less cancel out. However, the composite index of consumption derived here clearly is preferable to a measure that relies entirely on official values and price deflators.

The CIA indexes for clothing and related items, based on production, do not allow for imports, which come mainly from CEMA countries. Although imports rose rapidly during the 1950s, they were miniscule relative to the value of retail sales. During the 1960s, imports in current prices increased at about the same rate as the value of production in constant prices. Although imports in current prices increased faster than real production in the 1970s, prices of imports evidently increased rapidly also. From this evidence, it appears that the CIA index for clothing is not seriously biased downward by failure to allow for imports. Exports of clothing have been negligible throughout the period.

Weights. The derivation of the 1970 expenditure weights for the soft goods index is shown in Table 9. Essentially, the task was to disaggregate the principal expenditure categories — retail sales for consumption and military subsistence. The allocation of retail sales to sub-groups can be made with confidence from published retail sales data and assumptions about the distribution of sales to enterprises and institutions. The distribution of the military clothing ration is tenuous but is probably not grossly wrong. Because their content is unknown, purchases of soft goods in collective farm markets, a small sum, were not distributed. The value of consumption in kind of wool was obtained by the methodology used to derive the total of such consumption and is thought to be reasonably reliable, the wool was assumed to be used to produce various items of knitted clothing.

Indexes. The data underlying all sub-indexes are given in Appendix C. Six sub-indexes are based on physical production data available in *Promyshlennost' SSSR 1964* and in annual *Narkhozy*. They include: knitted outerwear, knitted underwear, leather footwear, rubber footwear, felt footwear, and hosiery. The series for leather footwear was adjusted for net trade and inventory change — needed because of rapidly rising imports. These adjustments could not be made for the other categories; imports are known to be

Table 9

Derivations of 1970 Weights for Components of the Index of Soft Goods

	Retail Sales for Consumption [a] (Billion Rubles)	Military Subsistence [b] (Billion Rubles)	Consumption in Kind [c] (Billion Rubles)	Total Consumption	
				(Billion Rubles)	Percent
Total	**40.370**	**1.199**	**.112**	**41.681**	**100.0**
Cotton fabrics	1.360			1.360	3.3
Wool fabrics	1.003			1.003	2.4
Silk fabrics	1.141			1.141	2.7
Linen fabrics	.246			.246	.6
Clothing	13.022 [d]	.932		13.954	33.6
Knit underwear	2.603	.043		2.646	6.3
Knit outerwear	4.127	.071	.112	4.310	10.3
Hosiery	1.691	.020		1.711	4.1
Leather footwear	6.210	.123		6.333	15.2
Rubber footwear	.865			.865	2.1
Felt footwear	.214			.214	.5
Household soaps and detergents	.651			.651	1.6
Toilet soap and cosmetics	1.140			1.140	2.7
Haberdashery and thread	3.623	.010		3.633	8.7
School and office supplies	.834			.834	2.0
Publications	1.640			1.640	3.9

[a] Total retail sales, less institutional purchases, services and commission sales. Retail sales are given in *Narkhoz 1972*, pp. 584-85. Institutional purchases were distributed on the basis of the shares in last half 1968-first half 1969 shown in *Vest stat.* No. 5, 1971, p. 37. Services were allocated on the basis of data in *Narkhoz 1972*, p. 621. Cloth used in repair and tailoring of clothing and knitwear was allocated to fabrics in accordance with their respective shares in retail trade. Laundry and dry cleaning services were allocated to clothing.

[b] Military subsistence was distributed among groups on the basis of information concerning the basic clothing ration and its cost by item.

[c] Wool.

[d] Excluding fur and fur products.

negligible for other footwear. One index clothing is based on official data on the value of production in constant rubles; the data are given in the above-noted sources. Few interpolations had to be made.

Eight indexes are based on deflated retail sales: fabrics (cotton, wool, silk, linen), haberdashery, school and office supplies, household soap and detergents, and toilet soap and cosmetics. Retail sales in current prices are available for nearly all years in the annual *Narkhozy* (e.g., *Narkhoz 1972*, pp. 584-585) as are specific indexes of state retail prices (e.g. *Narkhoz 1972*, p. 603). Price indexes for linen cloth, household soap and detergents, and toilet soap and cosmetics were derived from current values and published indexes of the value of sales in constant prices (e.g., *Narkhoz 1972*, p. 555). The index for publications is based on retail sales in current prices until 1977; no important price changes are known to have been made for these goods until then, the prices of which are kept low as a matter of social policy.

Durables and Miscellaneous Goods

Scope and Coverage. The index implicitly covers all goods purchased in state and cooperative retail outlets, except those covered by the indexes for "food, beverages and tobacco" and for "soft goods." The index includes furniture, household appliances, radios and TV sets, passenger cars, sports equipment, toys, musical instruments, dishwares, motorcycles and bicycles, watches and jewelry, and a variety of odds and ends not specifically identified in the published data on retail sales. The statistics are not detailed enough to permit an accurate matching of the US classification of goods into consumer durables and consumer nondurables. Nonetheless, the classification used here for the USSR — durables and miscellaneous goods consists mainly (at least four-fifths) of items classified as durable goods in US national accounts.

The index for durables and miscellaneous goods is based on a deflation of total retail sales of such goods; it is not a sample index. Unfortunately, the coverage of the index is not identical with that of the 1970 value weight, which is used to move the index, but this discrepancy is not thought to be serious. With the detail available, it is not possible to provide an exact match. The coverage of the weight and the index overlap by at least 80 percent. The items implicitly covered by the index, but not by the weight, are repair services for autos and household durables, building materials, a variety of goods of unknown composition included in a residual category in Soviet retail sales data, and retail purchases made by state enterprises and organizations.

The index based on the deflation of total retail sales of durables and miscellaneous goods employs current price values and an implicit official retail price index as a deflator. Despite the reservations already noted about the reliability of official retail price indexes, no better approach to constructing the index could be devised, given the paucity of data available. The deflated sales approach replaced a method based on a sample of nine product groups, some measured by production or sales in physical units and some based on retail sales. This sample, severely limited by the availability of Soviet data, was seriously unrepresentative. It was dominated by a group of goods — furniture, household appliances, radio and TV sets and automobiles — that increased very rapidly from very low levels; these rapidly growing items made up over two-thirds of the weight. Analysis of retail sales data showed that the rest of the goods covered by the weight were increasing much less rapidly. The unreliability of the sample index also was indicated by the fact that its rate of growth was far higher than an official production series in constant rubles labeled "Proizvodstvo tovarov kul'turno-bytovogo naznacheniya i khozyaystvennogo ob'ikhoda," (cultural and household goods — hereafter referred to as *tovary*), which evidently includes most of the goods involved. This value series itself is probably biased upward, because of unreliable price deflators. Lack of data precluded expansion of the sample to make it more representative.

The present index based on deflated retail sales, unlike physical value and production based indexes, incorporates imported goods and reflects changes in product mix and quality. On the other hand, it is probably biased upward, because of the flaws in official price indexes. Disguised price inflation may be serious for durable goods, but there is no way to estimate the degree of bias. The index can be compared with two other measures with similar (though not identical) coverage. One is the official Soviet series for the production of household durables and related items mentioned above. The series in constant rubles (*tovary*) is believed to include automobiles and to be distorted by changing coverage.[12] The other index is a composite of the CIA indexes for production of consumer durables and furniture, weighted by estimated value of retail sales for the two components in 1970. These indexes, components of the CIA index of Soviet industrial production, include passenger cars and implicitly, all of the items included in the *tovary* series except household chemicals. A comparison of the three indexes is shown below (1950 = 100):

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[12] The coverage of the *tovary* series is not entirely clear. The *Narkhozy* regularly provide data, mainly in physical units, for a list of the "basic" kinds of goods included. Clearly, it includes household appliances, radio and TV sets, musical instruments, motorcycles and bicycles, furniture, household chemicals, dishware and many other products. A key question is whether it includes passenger cars. Although not absolutely certain, the weight of the evidence suggests that it does. It is also probable that the coverage of the series has been expanding. Both conclusions are supported by a lengthy discussion of the *tovary* complex of goods in R. A. Lokshin, *Spros, proizvodstvo torgovlya*, Moscow, 1975, pp. 185-216. Other evidence for the belief that automobiles are included is provided by comparisons of growth rates for production of *tovary* during 1971-75 with (1) growth rates for all components listed as included (*Narkhoz 1975*, pp. 294-295) and (2) growth rates for retail sales in constant prices of all identified components for which such series are available. Among the production series, all those with large weights increased much less rapidly than *tovary* as a whole. A similar situation prevailed for the retail trade series. Finally, retail sales of identified *tovary* (less furniture) in current prices rose by 44 percent during 1971-75, residual retail sales of non-food goods, which include cars, increased by 128 percent, and production of *tovary* (including furniture) increased 64.5 percent. From what is known about relative values of the various components, it is hard to account for such a fast growth rate unless cars were included.

	Index of Consumption of Durables and Miscellaneous Goods	CIA Index of Production of Consumer Durables and Furniture [a]	Index of *Tovary*
1960	449	408	428
1970	979	1,055	1,269
1975	1,660	1,773	2,018

[a] Weighted by estimated retail sales of durables (78.4 percent) and of furniture (21.6 percent).

Although the index of consumption grew more slowly than the production-based indexes, the rates of growth shown by the three indexes are not greatly different. A number of factors may account for the differences: (1) differences in coverage, (2) probable price inflation in the *tovary* series, (3) the fact that the CIA production index reflects the *tovary* series in part, (4) the production-based series include exports and some non-consumption usage, while the consumption index reflects imports, (5) the production-based series allow for inventory accumulations.

Weights. The 1970 weight represents the value of relevant categories of goods identified in Soviet retail sales data plus a share of the residual of unidentified sales, less repair and other applicable services, commission sales, and purchases by state enterprises and organizations. The details are described in Appendix D of JEC, *GNP, 1950-80*. The category weight is judged to be quite reliable.

Index. The index for durables and miscellaneous goods is derived from three sets of regularly published data: (1) value of retail sales by major product category in current prices, found, for example, in *Narkhoz 1975*, pp. 626-627; (2) indexes of prices in state and cooperative retail trade by major product group (found, for example in *Narkhoz 1975*, pp. 645), and (3) for a few categories, indexes of the growth of retail sales in constant prices (found, for example, in *Narkhoz 1975*, p. 590). From these data it is possible to obtain a series of ruble values of total retail sales of non-food goods in constant 1970 rubles and likewise a series of similar values for tobacco and for 17 categories of soft goods that are included in our indexes for food beverages, and tobacco and for soft goods. The sum of these 18 values for each year was then subtracted from the total value of non-food goods in that year to obtain the residual value in constant 1970 rubles. The residual consists almost entirely of durables and miscellaneous related goods. The procedure, in effect, derives the price deflator for this group of goods that is implicit in the values and indexes in current and constant values published by the Soviet government. This outcome is made possible by the fact that the official indexes of retail prices are linked indexes employing given year weights (S. G. Stolyarov, *O tsenakh i tsenoobrazovanii v SSSR*, Moscow, 1969, p. 103). The values underlying the index of durables and miscellaneous goods are shown in Appendix D.

Services

The index of services is a weighted average of an index of household services and an index of communal services. The weights are those for 1970 used in GNP by end use.

Household Services

The index for household services is a weighted aggregate of six sub-indexes for major types of services housing, utilities, transportation, communications, repair and personal care, and recreation. The indexes as a group cover all of the major household services; any services omitted would be insignificant in terms of consumer expenditures. The Soviet Union lacks most of the financial and related services that are important in Western countries. Although some, such as legal services, do exist, there are no data concerning them. The 1970 expenditure weights used to aggregate the 6 sub-indexes are those used in GNP by end use; they are described in detail in CIA, *GNP 1970* and in JEC, *GNP, 1950-80*, Appendix D. The data underlying each of the sub-indexes are given in Appendix E.

Housing. *Scope and Coverage.* The index measures the flow of housing services in real terms by the change in the total stock of living space available expressed in square meters. The stock includes all housing, public and private, urban and rural. About 80 percent of rural housing and 25 percent of all urban housing is privately owned. State housing consists mainly of multi-family buildings, where small apartments are rented at heavily subsidized rates. The basic rates have not been changed since they were set in the 1920s. In the US national accounts, housing services as a component of personal consumption are measured by expenditures in current prices, deflated by an index for rents that is a component of the Bureau of Labor Statistics, Consumer Price Index. Value data are not available for the Soviet Union.

Presumably, an index based on housing space alone understates the real gains by failing to capture qualitative improvements. However, there is little evidence to show that the physical quality of housing construction per se in the USSR has improved much over the years. Although the average size of a dwelling unit increased between 1950 and 1978 — by 17 percent for public housing and 77 percent for private housing (*Narkhoz 1970*, p. 541; *Narkhoz 1978*, pp. 393, 395), urban housing remains crowded. The number of new dwelling units built, however, has failed to keep up with the number of new families formed. As a consequence, many families and single persons must share living quarters. Morton has estimated that in 1970 there were 1.23 households per dwelling unit, a rough measure of the extent of overcrowding.[3] Also, urban families often must share kitchens and baths with other families — some 30 percent do, according to a recent Soviet source.[4] While state urban housing has been increasingly provided with amenities — baths, hot water, plumbing and electricity — most rural housing and probably some private urban housing still lack all of them except electricity. Most of this aspect of improvement in housing conditions is captured in the index for utilities.

The diverse considerations discussed suggest that no adjustment to the housing index needs to be made for quality change. Probably the largest element in improvement of housing conditions for the individual under Soviet conditions is simply more space, which the index measures when expressed per capita.

Weights. The weight for housing is the sum of (1) cash rents paid by tenants in urban public housing, (2) imputed rents at the state urban public rate per square meter for owner-occupied urban private and all rural housing, and (3) expenditures by tenants and owners for current repair of housing. The derivation of the weight is described in CIA, *GNP 1970*, p. 41. The average state rental rate was obtained from a Soviet source; use of that rate for imputation to owner-occupied housing was considered appropriate. Although the average quality of private housing construction is perhaps lower than for state housing, the average new privately built unit has been appreciably larger than the average state unit since 1960. Moreover, the state rental rate covers only about one third of total maintenance costs.

Index. The index used to measure housing services is an index of total living space, computed as the sum of separate estimates for midyear stocks of urban and rural housing, respectively. The estimates are based on data regularly published in annual statistical handbooks (e.g., *Narkhoz 1977*, p. 415). Although urban stocks are reported directly, rural stocks are not. They can be estimated quite satisfactorily, however, from a Soviet estimate of the stock in 1959, relevant official data bearing on changes in the stock via new construction and transfers to urban stocks, and an assumption about retirement rates. The sources and methodology for deriving the total stocks are described in detail in Willard S. Smith, "Housing in the Soviet Union: Big Plans, Little Action," in JEC, *1973*, pp. 419-422. This source gives the estimates for 1950, 1955-71; estimates for 1951-54 were interpolated. Estimates for 1972-80 were obtained by the same methodology with data given in *Narkhoz 1975*, pp. 570, 576, 578, and for subsequent years in comparable tables in the respective annual *Narkhozy*.

Utilities. Scope and Coverage. The sector comprises household public utilities — electricity, gas, and centralized supply of heat and hot water, cold water and sewage disposal. The index, a composite of three series expressed in physical units, is designed to measure household outlays on these services in real terms. The sector is defined in the same way as the Soviet category "communal payments," (*Metodicheskiye ukazaniya*, 1969, p. 535) except that outlays on hotels and dormitories, included there, are classified in recreation and in housing in the GNP accounts.

As defined here, the sector is essentially the same as the "household utilities" component of the sector "household operations" in US national accounts for personal consumption. The procedure in the US is to measure real consumption of utilities by deflating money expenditures by appropriate price indexes. Lack of data precludes this approach for the USSR. However, the Soviets claim that basic utility charges have not changed in recent decades. The coverage of the utilities index is essentially complete. The 1970 weights for the three sub-indexes are based on data given in a Soviet source. Although the sub-indexes are based on physical series (kilowatt-hours of electricity, cubic meters of gas, square meters of state urban public housing stock), they are considered suitable as measures of real consumption trends. Quality changes are not important in this sector. The change in the urban public housing stock was selected to move the expenditure weight for centralized heat, water and sewage disposal because separate physical indicators are not available and because the bulk of such services are provided to state-owned housing. Although the share of housing units provided with such amenities evidently has been rising, the data are insufficient to allow for this factor.

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[3] JEC, *1979*, p. 797.

[4] A. Andreev, *Housing*, Moscow, Novosti Press, 1976, pp. 14-15.

Weights. The expenditure weights for the three subindexes electricity, gas, and other utilities represent their respective shares in total household outlays in 1970 and were derived from a table given in *Ekonomicheskie nauki*, no. 11, 1973, p. 44. The percentage shares are, respectively, 45.1, 9.1 and 45.8. The share allocated to "other utilities" is the sum of the source's categories "water pipes and sewer systems," "heating" and "hot water supply." The latter two, with over four-fifths of the category weight, are supplied as joint products.

Index. The index for utilities is a weighted composite of three separate indexes electricity, gas, and other utilities (heat, water, sewage disposal).

Electricity. The index reflects the consumption of electricity by all households, rural and urban, measured in kilowatt-hours. Consistent data are available for only 3 years 1960, 1970 and 1975. Consumption in 1960 is estimated at 17.358 billion kilowatt-hours on the basis of the statement that household use of electricity amounted to 81 kilowatt-hours per person (*Energetika SSSR v 1971-75 godakh*, Moscow, 1972, p. 61) and a mid-year population of 214.3 million. Consumption in 1970 is given at 41.2 billion kilowatt-hours (Ibid., p. 63). Consumption in 1975 is given as 56.6 billion kilowatt-hours (*Energetika SSSR v 1967-1980 godakh*, Moscow, 1977, p. 47). Total household consumption is estimated at 9.251 billion kilowatt-hours in 1950 based on some information with respect to urban use and rural use. Urban household consumption in 1950 is reported at 9.412 billion kilowatt-hours (P. S. Neporozhniy (ed.), *Elektrifikatsiya SSSR*, Moscow, 1970, p. 522). This figure evidently includes electricity used for street lighting, which was estimated at 481 million kilowatt-hours on the basis of the share of street lighting in 1958 (I. T. Novikov, *Energetika SSSR*, Moscow, 1961, p. 377) and the assumption that the share was the same in 1950.

Total use of electricity by *rural* households in 1950 was estimated at 320 million kilowatt-hours on the basis of some information for 1953. Total consumption for all uses by agriculture is reported at 1.538 billion kilowatt-hours in 1950 (*Sel'khoz 1971*, p. 402). Consumption for nonproductive uses for 1953 can be estimated at 27.7 percent of total consumption in 1953 from data in *Sel'khoz 1960*, pp. 428, 432, 436. This share was assumed to apply to 1950, and the further assumption was made that household use accounts for 75 percent of the total. The Soviets report that 10 percent of collective farm households (2.050 million) had electricity in 1950 (*Sel'khoz 1971*, p. 402). Comparable figures are not available for state farms, but the share probably was higher; they employed 2.425 million workers in 1950. Since communal facilities were scarce in rural areas, household use probably constituted most of the non-productive use of electricity.

Estimates for all other years were derived by interpolation on the basis of average annual rates of growth. Household consumption in 1976 and thereafter was estimated on the assumption that its share of total production of electricity, regularly reported in *Narkhoz*, was the same as in 1975 (5.45 percent).

Gas. The index measures gas consumed by households in billion cubic meters. Data on actual consumption are available for 1966-76 (*Ekonomika gazovoy promyshlennosti*, No. 2, 1978, p. 7) and for 1960 (*Gazovaya promyshlennost'*, No. 4, 1970, p. 55). Consumption in all other years was estimated on the assumption that the household share ws 3.75 percent of total production of natural gas in each year. In 1960, the share was 3.97 percent (Ibid.). During 1967-76, its share fluctuated between 3.49 percent and 4.15 percent; its share was 3.89 percent in 1976. Data on production of natural gas are given as follows: 1950-62 *Prom. 1964*, p. 213; 1963 *Narkhoz 1969*, p. 198; 1970-76 *Narkhoz za 60 let*, p. 205 and in similar tables in *Narkhozy* for subsequent years.

Other Utilities. The measure for this category is an index of the midyear urban public housing stock expressed in m^2. Mid-year stocks were calculated from data on end-of-year stocks given as follows: 1950 *Narkhoz 1922-1972*, p. 367; 1952, 1958-62 *Narkhoz 1962*, p. 499; 1963-64 *Narkhoz 1964*, p. 610; 1965-68 *Narkhoz 1968*, p. 580; 1969 *Narkhoz 1969*, p. 568; 1970-75 *Narkhoz 1975*, p. 576; 1976 and following years similar tables in the respective annual *Narkhozy*. Stocks in 1951 and 1953-57 were interpolated.

Transportation. *Scope and Coverage.* The index of transportation is a measure of passenger transportation services in real terms. It is a weighted composite of physical series for 9 modes of transport — rail, sea, river, bus, air, tram, trolleybus, subway, and taxi. The coverage of the index is complete.[15] Both the weights and the physical series are based on officially published data, and little interpolation or estimation was required. The component indexes use quantitative indicators, mainly passenger kilometers and number of passengers. Quality change does not seem to be a serious problem in this sector although the basic equipment has been modernized over the years, thus probably making transportation physically more comfortable. However, the degree of crowding likely has not been much reduced.

In the U.S. transportation services as a component of personal consumption in the national accounts are measured by current expenditures deflated by BLS price indexes. Annual expenditure data are not available for the USSR. According to Soviet statements, fares for the various types of passenger transport have not been changed for decades, except for air and taxi fares in the late 1970s.

Weights. The weights used to aggregate the 9 subindexes are average revenue rates per passenger kilometer, per kilometer or per ride. The weights and their sources are as follows:

Mode	Average Rate (kopecks)	Source
Rail	0.87 per pass. km	*Transport i svyaz'*, 1972, p. 111.
Sea	7.46 per pass. mile	*Ibid.*, p. 151
River	1.48 per pass. km	*Ibid.*, p. 186.
Bus	1.31 per pass. km	*Ibid.*, p. 241.
Air	1.74 per pass. km	N.N. Belenkiy, *Ekonomika passazhirskikh perevozok*, 1974, p. 241, with a 25 percent profit markup added.
Tram	3.0 per ride	N. B. Chestniy, *Tarify na kommunal'nyye uslugi*, 1968, p. 19.
Trolleybus	4.0 per ride	*Ibid.*
Subway	5.0 per ride	A. G. Kreykin (ed.), *Passazhirskiye tarify na transport SSSR*, 1966, p. 19
Taxi	11.50 per km	*Transport i svyaz'*, 1972, pp. 247-54.

Index. The nature and sources of data for the subindexes are summarized below:

Mode	Physical Measure	Sources
Rail, river, bus, air	Passenger km	*Transport i svyaz'*, 1972, p. 19, and similar table in *Narkhozy* in subsequent years.
Sea	Passenger miles	*Transport i svyaz'*, 1972, p. 139 and similar tables in *Narkhozy* for subsequent years.
Tram, trolleybus, subway	Passengers	*Transport i svyaz'*, 1972, pp. 256-57 and similar tables in *Narkhozy* for other years.
Taxi	Passenger km.	*Transport i svyaz'*, 1957, pp. 256-57; *Transport i svyaz'*, 1972, pp. 246-47; similar tables in *Narkhozy* for other years.

Communications. *Scope and Coverage.* Soviet statistical practice defines the sector to include the postal services, telephone system, telegraph system, radio and television broadcasting, and miscellaneous special services.[16] The index for the sector is a composite of four physical output series for the major forms of communications — postal, telegraph, telephone, and radio and television; the four series are aggregated with 1970 average revenue (implicit unit price) weights. The coverage of the index evidently is quite complete, only "miscellaneous services" being omitted. The sum of the revenues for the four types included in the index comprised 98 percent of the total reported revenue (*Transport i svyaz'*, 1972, p. 302).

The data used for revenue weights and indexes refer to total activity of the sector, i.e., services rendered to business firms and government, as well as to private persons. There are no data by type of customers; evidence that the household share has been relatively stable is provided by a comparison of household expenditures on communications in 1960, 1965, 1970 and 1972[17] with the total value of output of communications in those years.[18] The household percentage shares are respectively: 38.5, 40.0, 33.3 and 34.2.

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[15] Although the index covers all passenger transportation — both private and business — the 1970 expenditure weight excludes estimated business travel outlays. Thus, their share in total outlays is assumed to remain constant.

[16] *Metodicheskiye ukazaniya*, 1974, pp. 755-756.

[17] I.M. Schneiderman, *Statistika uslug*, 1974, p. 62.

[18] *Narkhoz 1972*, p. 461.

Weights. The weights for the four sub-indexes and for the components of the telephone indexes are the revenues for the various kinds of services provided by the Ministry of Communications (*Transport i svyaz'*, 1972, p. 302). There are no data with which to obtain separate value weights for the individual components of the postal and radio-TV broadcasting sub-indexes.

Index. The nature and sources of data for the four sub-indexes are shown below:

Sector	Nature of Series	Sources
Postal	Sum of the number of letters, newspapers and magazines, parcels, and money orders and pension payments	*Transport i svyaz'*, 1972, p. 274 and similar tables in *Narkhoz* for subsequent years
Telegraph	Number of telegrams	*Ibid.*
Telephone	Weighted sum of number of inter-urban calls, urban sets, and rural sets	*Transport i svyaz'*, 1972, pp. 274, 283, 285 and similar tables in *Narkhoz* for subsequent years
Radio-TV broadcasting	Sum of the number of radios, TV sets, and wired loudspeakers	*Transport i svyaz'*, 1972, p. 292 and similar tables in *Narkhoz* for subsequent years.

Repair and Personal Care. *Scope and Coverage.* As defined here, the sector encompasses a wide variety of personal services, the most important of which are: repair and tailoring of clothing, repair of household appliances and automobiles; shoe repair; barbershops and beauty parlors; public baths; and photographic services. The coverage is nearly identical to that of the Soviet statistical category *Bytovoye obsluzhivaniye naseleniya* ("everyday servicing of the population"), except that the latter includes housing construction and repair, which is included in "housing" in the GNP accounts. In Soviet practice, these services are classified partly as "productive" and partly as "non-productive," but statistics for both groups combined are now reported regularly in the annual handbooks. The coverage of the sector is described in *Metodicheskiye ukazaniya*, 1974, pp. 774-776.

In U.S. national accounts these services are classified mainly in "personal services" and "miscellaneous repair services and hand trades." For the most part, the indexes used to measure expenditures in real terms are calculated as the deflated values of outlays in current prices.

The index for "repair and personal care" is a weighted composite of separate indexes for state-supplied services and for privately supplied services. Both purport to represent the value of such services in constant 1970 prices. Although the coverage of the combined index is virtually complete, the underlying data leave much to be desired. The index for state services is based on published values reported for some years in current prices and for other years in various kinds of constant prices. To complete the time series, use was made of growth rates for the RSFSR and various assumptions for years for which no data could be found. The series for private services relies on survey data relative to the RSFSR in 1960-1971 and on assumptions about their growth in other years. The unsatisfactory state of the data is a result of the fact that state-supplied personal services were long neglected and that systematic data are not compiled on privately supplied services. Evaluation of the quality of the resulting index is difficult. It relies in part on official price deflators of an unknown character. The index, as a consequence may overstate the growth of state-supplied services. On the other hand, the assumptions (and the data) on trends in private services may understate their growth. Clearly, the total supply of services has been increasing rapidly as incomes have risen. The index reflects this expected result; the degree of accuracy is hard to assess.

Weights. Separate values for state and privately supplied services were derived for the 1970 GNP weights. The value for state-supplied services was obtained as shown below: The value of private services is estimated in CIA, *GNP 1970*, p. 42, except that housing repair services are now estimated at 1.071 billion rubles. (See tabulation on next page.)

Indexes. **State-supplied services.** The construction of this sub-index entailed a series of linkages based on diverse data.

1. The procedure described on the following page to obtain the value for 1970 was used to obtain similar values in current prices for 1960 and 1965-1972 and in comparable prices for 1965 and 1970-76. The values of sales to enterprises were estimated from the shares given in Dmitriev, *op. cit.*, p. 98 for 1965, 1970, and 1972. Their share in 1965 was used for all preceding years. Extrapolation for 1973-76 was made on the basis of the average annual rates of growth of their

State-Supplied Services, 1970

	Million Rubles
Total services	**4,044.4** [a]
Less sales to enterprises	307.4 [b]
Less 95 percent of the housing services sold to enterprises	375.0 [b]
Plus 96 percent of the materials used in tailoring of clothing	1,003.1 [c]
Plus 96 percent of the materials used in tailoring of knitwear	115.4
Equals consumer purchases of services	4,480.7

[a] *Narkhoz 1972*, p. 621.
[b] Estimated on the basis of percentage data given for the RSFSR in V. I. Dmitriev, *Metodologicheskiye osnovy prognozirovaniya sprosa na bytovyye uslugi*, 1975, p. 98 and ruble values in *Narkhoz RSFSR 1972*, pp. 401-402.
[c] Materials are assumed to constitute half of total sales approximately the ratio for earlier years shown by data in *Narkhoz 1968*, p. 664 and *Narkhoz 1969*, p. 660. Enterprise sales are calculated at 4 percent of enterprise purchases of tailoring services, the share that can be derived from Dmitriev's data.

share during 1966-72, using data on total sales given in *Narkhoz 1972*, p. 621 and similar tables in *Narkhozy* for subsequent years. The share was assumed to remain unchanged after 1976. The share estimated for that year (16.9 percent) accords well with a Soviet statement that the share was almost 18 percent in 1975.[9] Because of a change in the way data were reported, use of this procedure for years after 1976 necessitated adding materials used in repair of durables and of housing to the published totals; these were estimated to be half of the totals, their shares in 1975-76.

2. These values in current and constant prices are used to splice together an index in constant prices for 1966-80.

3. The index for 1960-65 is based on constant price values given in L. A. Bobrov, N. V. Gukov, and K.S. Gulevich, *Ekonomika bytovogo obsluzhivaniya naseleniya*, 1971, p. 27.

4. Data in current prices for the RSFSR, cited in *Ibid.*, p. 24 for 1958-62 were used to obtain an index for 1958-60. For 1956-58 the annual growth rate is based on constant price data for the RSFSR, given in L. A. Bobrov, *Ekonomicheskiye problemy bytovogo obsluzhivaniya naseleniya*, 1978, p. 58. An annual growth of 10 percent was assumed for 1950-55, the rate reported for 1950-54 in Bobrov, et al, 1971, p. 23.

Privately-supplied services. The growth rates of these services during 1959-1970 are based on data for the RSFSR given in V.I. Dmitriev, *op. cit.*, p. 45. For 1950-58, the 1959 value was assumed. The level in 1970 was assumed the same in all following years, on the reasoning that the fast growing supplies of state services would tend to crowd out private services, given the generally hostile official attitude toward them, even though money incomes continued to rise rapidly. There are no other data on the trend in the supply of these services.

Recreation. *Scope and Coverage.* As defined here, the sector encompasses activities providing entertainment and recreation services to the population that are largely paid for out of household incomes. Conceptually, the sector includes both public and private purveyors of entertainment and recreational services, such as movies, theater, ballet, concerts, circuses, sports, vacation resorts, and lodging facilities. There is no direct counterpart of this sector in the Soviet classification of economic activities; rather, the sector encompasses "art", a component of the category "culture and art;" "sanitoria and resorts" and "sports and physical culture organizations," both components of "health and physical culture"; and "hotels," a component of "housing-communal economy and everyday services." (See *Metodicheskiye ukazaniya*, 1974, pp. 762, 764, 767.) The categories in US national accounts that would be encompassed in "Recreation" are: motion pictures, amusements and recreational services n.e.c., and hotels and other lodging places.

The index used to measure the activity of the sector is a weighted aggregate of three sub-indexes: "entertainment," "resorts" and "leisure." The first reflects the activities of movies, theaters, sports, and other entertainment enterprises. The second represents the activities of vacation resorts, which are publicly operated and heavily subsidized in the USSR. The third is intended to represent recreation in the form of travel, not yet common in the USSR. Available data do not permit satisfactory measurement of these diverse activities. Neither expenditure data nor price deflators are available for developing the deflated expenditure series that are employed to measure comparable activities in US national accounts. As a substitute, several physical series were selected to represent the various types of activities and aggregated with 1970 expenditure weights. Despite reservations concerning both the sub-indexes and weights, the composite index probably reflects real outlays on recreation reasonably well. Its relatively slow growth is consistent with the traditional reluctance of the Soviet government to invest in the provision of recreational facilities and with the impact of rapidly growing availability of television on attendance at movies and similar activities.

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[9] N. V. Gukov, *Ekonomika, organizatsiya i planirovaniye material'no-tekhnicheskogo snabzheniya predpriyatiy bytovogo obsluzhivaniya*, Moscow, 1977, p. 14.

Weights. The derivation of the 1970 expenditure weights for the three sub-indexes is explained in CIA, *GNP 1970*, p. 42.

Indexes. **Entertainment.** The index is based on the sum of the numbers of paid admissions to movies and admissions to theaters. These are the only series of data on entertainment that are regularly published. The data are to be found in two tables regularly published in annual handbooks, e.g., *Narkhoz 1972*, p. 669.

Vacation resorts. The index is based on the number of persons staying at "sanatoria, resort polyclinics, rest homes and pensions" in each year; the series excludes visitors to "rest bases" and "tourist bases," which are essentially campgrounds and shelters. There are no other data available to reflect such forms of recreation. Data for 1950, 1958, 1960-80 are given in tables regularly published in *Narkhozy*, e.g. *Narkhoz 1972*, p. 569. Growth rates for other years are interpolated.

Leisure. The index is based on manhour employment in hotels. There are no other data available on this form of travel and recreation, which is greatly underdeveloped in the Soviet Union. Employment in hotels was estimated for 1950-69 in Stephen Rapawy, *Comparison of US and USSR Civilian Employment in Government, 1950-1969*, US Bureau of the Census, International Population Reports, P-95, No. 69, April 1972, p. 17. Estimates for subsequent years are based on the assumption that employment in hotels increased at the same rate as employment in the housing-communal economy, regularly reported in *Narkhoz*, e.g., *Narkhoz 1977*, p. 378. The annual number of manhours worked in hotels is assumed to be the same as that in housing-communal economy. Manhours for 1950-74 are estimated in Stephen Rapawy, *Estimates and Projections of Civilian Employment in the USSR, 1950-1990*, US Bureau of the Census, Foreign Economic Report No. 10, September 1976, p. 60, and extended to 1980 by him.

Communal Services

The index of communal services is a weighted aggregate of separate indexes for education and for health. The coverage of these services, nearly all state-provided, is virtually complete. The 1970 weights used to combine the indexes are total current expenditures on these services by the population and by the government. The data underlying the two sub-indexes are shown in Appendix F.

Education. *Scope and Coverage.* The definition of the sector follows Soviet statistical practice and includes (1) kindergartens and all types of general education schools concerned with the education and rearing of children, (2) trade schools (vocational-technical schools), and (3) higher and secondary specialized educational institutions of all kinds (*Metodicheskiye ukazaniya*, 1974, pp. 755-56). The coverage coincides, mostly, with "private education and research," a component of personal consumption expenditures in the US national accounts, plus government expenditures on education. Expenditures on nursery schools and on public libraries in the US are included in education; in the USSR, the former are included in "health" and the latter in "culture."

The index of education services is a weighted composite of two sub-indexes — personnel services and other current purchases, mainly food, utilities and supplies. The index for personnel is a measure of manhour employment and is used to move wage expenditures in 1970. The result is equivalent to the procedure used by Bergson and Becker and also to that in the US, where total wage expenditures are deflated by an index of average wages. The index for other expenditures is a deflated value series, as are similar indexes constructed by Bergson for the USSR for 1928-55 and by the Department of Commerce for the US. Use of manhours as a measure of personnel services makes no allowance either for productivity change or for improvement in the quality of education in general that may have resulted from changing skill mixes and an upgrading of the level of qualification of teaching staffs. Because a suitable measure of productivity in education has yet to be devised and agreed upon, the practice in the US and elsewhere is to measure education services in real terms on the basis of inputs, as is done here for the USSR. In its measure, the US does make some allowance for changes in the quality of labor inputs (skill mixes). The data required for an adjustment for rising qualifications and changes in skill mixes are not available for the USSR.

Weights. The weights used to combine the subindexes for personnel services and other current expenditures are their respective shares in 1970 of total expenditures on education, excluding investment and student stipends. Their derivation, revised from that used in CIA, *GNP 1970*, is explained in Appendix D of JEC, *GNP, 1950-80*.

Indexes. **Personnel services.** The index of total manhours worked in education was obtained as follows:

a. Estimates of manhour employment in "education and culture" combined during 1950-74 are presented and the derivation described by Stephen Rapawy, Foreign Economic Report No. 10 (loc. cit.), pp. 50-51 and extended to 1980 by him.

b. Estimates of total manhours worked in education alone were obtained by subtracting estimated manhours in culture from manhours in education and culture combined. Estimates of manhours in culture were obtained by multiplying employment in culture in each year by the number of manhours worked per person.

c. Average annual employment in culture is given for 1940, 1965, 1970-75 in *Narkhoz 1975*, p. 533, for 1966 in *Trud v SSSR*, 1968, p. 27 and for 1976-80 in *Narkhoz 1980*, p. 358. Employment in culture in 1965 and 1966 was 8.4 percent of total employment in education and culture; its share was about the same in 1940. Accordingly, employment in culture in 1950-64 was calculated by assuming that its share was 8.4 percent in each year. Estimates for 1967-69 were interpolated. Employment in education is obtained by subtraction for those years in which it is not reported directly.

d. Average annual man-hours worked in culture are estimated by a procedure similar to that used by Rapawy (loc. cit.). The procedure assumes that hours worked annually per person employed in culture follows the trend derived for industry. The level of annual manhours in culture was calculated by applying to the level for industry in each year the ratio of the scheduled workweek in culture (38.6) to that in industry (40.7), as reported in *Vest. stat.*, No. 4, 1978, pp. 94-95.

Other current purchases. The index is based on estimates of these purchases in current prices, deflated by a price index.

(a) Other current purchases in current prices

Total purchases in each year are based on estimates made separately for kindergartens, general education schools (including children's homes and boarding schools), higher education (*vuzy*), and secondary specialized educational institutions (*tekhnikums*). Expenditures for these types of schools make up over 80 percent of total outlays on education. Data for other schools (mainly trade schools, correspondence schools and the like) are not available.

The procedure used to estimate other current purchases for each type of school was as follows: (1) using the distribution of expenditures in the budget of the union-republics, investment expenditures were first deducted from total expenditures to obtain a series for total non-investment outlays. From this value for each year was then deducted the sum of wages and social insurance, stipends, capital repair, and purchases of equipment. The result is a series of values for other current purchases financed from the budgets of the republics.

(2) The values obtained in step (1) were expressed as percentages of total non-investment outlays from republic budgets. To obtain the values for other current purchases for the USSR as a whole, these percentage shares were multiplied by total non-investment outlays reported or calculated for the USSR. The procedure assumes that the distribution of expenditures for each type of school in the total state budget is the same as that in the sum of republic budgets. The latter accounted for roughly 85 percent of the total in 1975. The distributions of expenditures in both types of budgets were similar in 1950-57, the only years when distributions pertaining to the total budget for the USSR are available.

(3) Distribution of expenditures from union-republics budgets by type of school, as well as total expenditures for the USSR, are available for the years 1950-57 and 1960-75 in the following sources: *Raskhody po sotsial'no-kulturnyye meropriyatiya po gosudarstvennomu byudzhetu SSSR*, Moscow, 1958, (thereafter referred to as *Raskhody*), pp. 11, 12, 38, 49-58, 95, 97; *Gosbyudzhet 1966*, pp. 23-24, 79, 82, 85-87, 89; *Gosbyudzhet 1972*, pp. 27-28, 85, 87, 91-94; *Gosbyudzhet 1976*, pp. 25-26, 82, 85, 88-91.

In making the calculations, allowance was made for a change in classification in the 1960s. Parental fees were added to total budget expenditures for kindergartens.

(4) For the years 1976-80, data on total non-investment expenditures by major kind of school are given in *Narkhoz 1980*, p. 525. The percentage shares obtained for 1975 in step (1) were used to calculate values of total current purchases for those years.

(b) Price index

Other current purchases by educational institutions encompass a wide variety of items. The largest category is food (estimated from budget data at 47 percent of the total in 1970). Other sizeable items are services and miscellaneous outlays (25 percent), bedding and uniforms (9 percent), and numerous items related to utilities, office supplies, and housekeeping expenses (15 percent). No satisfactory price index exists or can be devised to deflate this mix of expenditures. Official industrial wholesale price indexes are too highly aggregated for categories other than food, and in any event are of dubious reliability, as are also the official indexes of retail prices.[8] In the belief that some deflation procedure, however crude, is preferable to none, it was decided to adopt a deflator that is implicit when the CIA index of household consumption of purchased goods in constant prices is compared with an index of retail sales of such goods in current prices that can be calculated from official Soviet data. The justification for employing this "alternative" index is as follows: (1) the need for some kind of deflation is recognized; (2) the implicit index is largely independent of official price indexes; (3) from a comparison of data in *Vest. stat.* No. 5, 1971, pp. 34, 36 with expenditure data in *Gosbyudzhet 1972*, p. 94 it is evident that schools, primarily kindergartens, purchase nearly all their food in retail outlets, as well as about one-third of all other material purchases.[9]

The implicit index — shown in Appendix F — declines by 13 percent during 1951-55 and rises by 40 percent during 1956-80; in contrast the implicit official price index (state and collective farm market prices combined) declines by 25 percent during 1951-55 and remains virtually unchanged thereafter. The interpretation and limitations of the "alternative" price index are discussed in *JEC 1976*, pp. 631, 651. A revised version of the index, along with a description of sources and methodology, is given in JEC, *1979*, p. 766. Despite its limitations, the "alternative" index is believed to reflect price changes far more accurately than the official index. Moreover, even the "alternative" index may be biased downward, because the CIA index itself incorporates several sub-indexes based on the value of retail sales in constant prices as measured by official price indexes. The sub-index for "durables and miscellaneous goods" is the most conspicuous example.

Health. *Scope and Coverage.* The sector is defined in Soviet statistical practice to include all activities concerned with public health — hospitals, clinics, sanatoria, vacation resorts, homes for the aged and disabled, and organizations concerned with social security and physical culture. In constructing the index of health services, expenditures on vacation resorts and sports activities are removed. The definition, then, corresponds, in the main, to the component "medical care and expenses" in the US national accounts for personal consumption expenditures plus government expenditures on health and hospitals and on medical vendor payments.

The index for health services is a weighted average of sub-indexes for "personnel services" and for "other current purchases" — mainly food, medical supplies, utilities, and housekeeping and office expenses. The underlying data are given in Appendix F. The nature of the index is the same as that for "education", described above. The discussion there of the limitations of such an index applies also to the index for health. In constructing the weights for the index, expenditures on physical culture and vacation resorts were deducted; they are included in the sector "recreation." Lack of detailed data prevented the removal of workers in physical culture from the employment data underlying the indexes. However, their share in total employment is small (5.2 percent in 1966); they are not included in the published outlays for "health," and therefore are omitted from the index of other current purchases.

Weights. The sub-indexes are weighted by estimated expenditures in 1970 on personnel services and on materials and the like. The weights, revised from those used in CIA, *GNP 1970*, are described in Appendix D of JEC, *GNP, 1950-80*.

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[8] On this point, see Morris Bornstein in Treml and Hardt, 1972, pp. 355-395.

[9] Separation of expenditures between material purchases and services follows the approach used in M. R. Eidel'man *Mezhotraslevoi balans obshchestvennogo produkta*, Moscow, 1966, p. 165.

Indexes. **Personnel services.** The index for personnel services is based on total manhours worked in "health and physical culture." The manhour series for 1950-1976 is presented and described in Stephen Rapawy, Foreign Economic Report No. 10, *loc. cit.*, p. 60, and extended to 1980 by him. It was not possible to remove manhours worked in sports organizations and vacation resorts from the series. There are no data with which to adjust the series either for changes in the educational quality of the labor force or for changes in the skill mix. However, the number of "middle medical personnel" — nurses, feldshers, medical technicians and the like — has increased faster since 1950 then has the number of doctors. Average life expectancy at birth in the USSR did not change between 1960-61 and 1971-72, when the publication of such data was halted. Life expectancy probably has declined since then, because infant mortality rates and death rates for adult males have been rising since 1969.[1]

Other current purchases. The index of other current purchases is obtained by a procedure similar to that used for education. The derivation is as follows.

(a) *Other current purchases in current prices*

(1) Data on total non-investment outlays for health financed from union republic budgets are available for 1950-57 and 1960-75, with a distribution by type of expenditure. To obtain "other current purchases" in each year, the sum of outlays on wages and social insurance, equipment, and capital repair was deducted from total non-investment outlays, and fees paid by parents were added. The values for "other current purchases" so obtained are then expressed as percentages of total non-investment outlays.

(2) Almost four-fifths of total expenditures on health is financed from republic budgets. To obtain values for "other current purchases" for the USSR as a whole the percentages derived in step (1) were multiplied by the values for total non-investment outlays financed from the state budget (union and republic budgets). This step assumes that the distribution of expenditures by object is the same in both types of budgets. The distributions were quite similar in 1950-57, the only years when such data for both budgets are available.

(3) The data for steps (1) and (2) are found in the following sources for 1950-75: *Raskhody*, pp. 71-72, 76; *Gosbyudzhet 1966*, pp. 57, 90, 94; *Gosbyudzhet 1972*, pp. 62, 95, 99; *Gosbyudzhet 1976*, pp. 60, 92, 96.

For years after 1975, data on total non-investment outlays for health financed from the state budget are given in the annual statistical handbooks, e.g., *Narkhoz 1978*, p. 536. The percentage share of "other current purchases" in the total was assumed to remain at the 1975 level; the share changed little in 1966-75. A small amount of current expenditures for health care is known to be financed from sources other than the state budget (funds of enterprises and trade unions, mainly). There are no data with which to take such expenditures into account in constructing the indexes.

(b) *Price index*

"Other current purchases" by institutions classified in the health sector encompass a wide variety of items. The most important one is food, which in the expenditures in republic budgets made up an estimated 32 percent of the total in 1970; the remainder consisted of medicines (26 percent), bedding and uniforms (8 percent), services and miscellaneous outlays (22 percent), and a variety of items related to office and housekeeping expenses (12 percent). The price index used to deflate this mix of expenditures is the same as that used to deflate a similar group of outlays of educational institutions. The considerations leading to this choice are similar to those set forth above in the discussion of the price deflator for other current outlays in education. Like schools and kindergartens, hospitals, rest homes, and children's nurseries purchase a substantial part of their supplies at retail outlets, particularly food. According to data in *Vest. stat.*, No. 5, 1971, pp. 34, 36, compared with data in *Gosbyudzhet 1972*, pp. 95, 99, these organizations purchased nearly all of their food from retail outlets and a significant share of other purchases.

The description and sources for the price deflator are given above in the discussion of the index for education.

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[1] Christopher Davis and Murray Feshbach, *op. cit.*, pp. 1-8.

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Appendix A

Table A-1

1970 = 100

Indexes of Total Consumption in Established Prices, by Category, 1950-80, and 1970 Category Weights[a]

	1970 Weights (Billion Rubles)	1970 Sub-index Weights (Percent)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	**211.083**		**33.8**	**34.6**	**37.1**	**40.2**	**43.0**	**45.9**	**48.2**	**51.8**	**55.4**	**57.7**
Goods	166.478		33.1	33.7	36.5	40.0	42.9	45.8	48.4	52.4	56.2	58.3
Food	107.926	100.0	39.5	39.0	42.3	45.9	47.5	50.9	53.1	57.4	61.3	62.9
Animal products	42.310		38.9	39.6	40.6	42.9	45.0	46.4	50.3	55.3	62.7	65.5
Fish		3.0	33.7	39.9	39.3	40.7	45.6	49.3	50.7	52.2	54.2	55.2
Meat		19.8	40.2	39.4	41.4	44.7	46.9	47.1	51.4	55.8	63.9	68.6
Milk		8.9	46.6	46.1	44.5	44.3	45.3	45.2	48.9	56.1	66.5	65.4
Butter		3.2	32.4	35.0	37.1	38.6	39.5	46.7	52.9	57.6	64.4	66.1
Cheese		0.7	15.3	17.7	19.0	21.4	23.2	27.6	30.8	32.4	35.4	36.8
Eggs		3.6	28.0	32.2	35.1	39.5	42.4	45.9	48.6	55.8	57.9	62.3
Processed foods	13.857		26.0	34.4	38.2	45.9	37.6	46.5	50.7	52.4	54.9	57.5
Sugar		5.1	19.2	32.3	34.5	45.5	45.1	45.3	48.6	51.1	51.9	54.4
Vegetable oil		1.0	29.5	35.4	39.1	48.4	55.1	46.3	50.8	54.2	58.9	63.7
Margarine		0.6	25.9	30.1	37.0	45.2	52.4	53.3	54.6	57.7	56.8	57.5
Confectioneries		5.6	31.3	36.7	40.9	45.0	46.6	44.6	51.0	51.0	54.5	57.7
Macaroni		0.5	28.9	33.8	44.4	55.5	65.4	69.8	63.7	71.6	77.0	73.8
Basic foods	22.890		72.4	60.4	68.6	72.6	76.4	79.6	78.2	82.8	83.4	84.1
Potatoes		4.0	137.5	62.1	89.8	97.9	102.1	92.0	93.6	95.9	98.3	100.0
Vegetables		3.2	46.1	43.8	48.1	55.5	58.0	68.0	65.2	67.4	73.7	70.8
Fruit		4.1	23.3	25.1	27.0	28.8	33.5	38.4	32.4	55.5	54.0	55.6
Flour and groats		9.9	75.2	79.6	84.0	86.0	89.8	95.4	95.1	93.9	92.7	93.7
Beverages and tobacco	28.869		20.8	23.3	26.0	29.2	32.9	36.9	38.5	42.6	44.8	44.7
Alcohol and soft drinks		23.4	19.6	22.2	25.0	28.2	31.8	35.9	37.6	42.1	44.2	43.8
Tea		0.6	29.1	32.7	34.2	39.1	40.6	46.7	39.6	40.6	49.8	49.8
Tobacco		2.7	29.3	31.1	32.9	35.8	40.2	43.2	45.6	47.5	49.3	51.2

Table A-1 (continued)

1970 = 100

	1970 Weights (Billion Rubles)	1970 Sub-index Weights (Percent)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Soft goods	44.294	100.0	24.5	27.7	29.3	32.5	37.8	39.8	43.2	46.1	49.6	52.7
Cotton fabrics		3.3	91.7	95.5	99.4	120.0	144.9	134.8	135.6	123.2	117.4	124.7
Wool fabrics		2.4	56.2	50.0	44.5	53.6	64.6	49.9	66.1	84.0	91.6	92.5
Silk fabrics		2.7	19.7	24.1	29.4	40.2	55.0	56.3	69.0	86.0	88.6	85.0
Linen fabrics		0.6	32.4	30.4	28.6	26.8	28.7	30.7	41.7	54.2	60.6	61.9
Sewn goods		33.5	19.5	22.2	24.9	27.8	33.1	36.6	40.3	40.7	44.5	49.2
Hosiery		4.1	35.3	44.7	43.7	45.7	50.4	57.7	60.3	63.1	66.3	69.2
Leather shoes		15.2	29.0	35.0	33.9	33.2	35.6	37.8	41.4	46.1	51.8	55.6
Rubber footwear		2.1	64.0	67.0	70.1	73.3	76.6	80.1	83.8	87.1	92.0	96.8
Felt footwear		0.5	70.4	72.0	73.3	74.8	75.8	77.0	76.1	83.0	89.9	97.8
Knitwear		16.7	14.1	18.1	20.4	22.7	26.5	28.9	29.0	31.0	33.1	33.2
Haberdashery		8.7	13.9	15.2	16.5	19.7	23.6	25.9	28.8	34.8	38.4	41.4
School supplies		2.0	13.5	15.1	17.0	20.1	23.9	24.7	27.6	30.3	32.7	35.3
Publications		3.9	19.3	20.2	21.2	23.1	25.1	28.4	31.9	35.4	39.1	43.6
Household soap		1.6	23.1	25.7	27.4	30.6	37.8	36.5	40.3	42.5	45.2	45.6
Toilet soap		2.7	13.4	15.0	16.7	21.7	28.2	31.3	32.7	37.8	40.6	43.1
Durables	14.258		10.8	12.6	14.4	18.8	24.1	26.3	28.8	34.8	38.3	41.8
Consumer services	**44.605**		**36.6**	**37.8**	**39.3**	**41.0**	**43.4**	**46.1**	**47.6**	**49.5**	**52.3**	**55.5**
Household services	21.612		31.6	33.0	34.5	36.0	38.1	40.8	42.1	44.1	47.3	51.5
Housing	3.429	100.0	48.1	49.4	50.7	52.1	53.6	55.4	57.3	59.8	63.0	66.7
Urban housing		54.9	33.6	35.0	36.4	38.4	40.9	43.5	46.1	49.2	53.2	57.6
Rural housing		45.1	65.8	67.0	68.2	68.8	69.2	69.8	71.0	72.8	74.9	77.8
Utilities	3.478	100.0	25.1	26.6	28.4	30.0	31.6	33.4	35.3	37.1	39.9	42.9
Electricity		45.1	22.5	24.5	26.9	29.0	30.9	33.2	35.4	36.6	38.7	40.9
Gas		9.1	22.9	23.2	23.2	33.5	33.8	34.6	36.1	39.4	14.2	17.9
Other utilities		45.8	32.0	33.3	34.8	36.3	37.8	39.3	40.9	43.1	46.1	49.9

Transportation	5.400	100.0	13.6	15.1	16.6	18.6	20.8	24.0	25.7	29.4	32.8	36.0
Rail		19.8	33.2	37.1	40.5	44.6	48.6	53.3	53.7	57.8	59.7	61.9
Sea		1.1	78.1	79.0	78.2	93.1	91.2	92.9	87.1	88.9	86.0	88.0
River		1.4	49.7	53.4	55.3	60.8	64.5	65.7	63.7	70.0	73.4	76.2
Bus		45.7	2.6	3.2	4.1	5.2	7.0	10.3	13.0	16.6	21.0	25.1
Air		11.7	1.5	1.9	2.2	2.7	3.1	3.6	4.0	5.8	8.2	11.6
Tram		4.1	64.8	67.6	70.5	73.5	76.7	80.0	80.6	85.6	90.4	93.6
Trolleybus		4.2	15.4	17.6	20.1	23.0	26.4	30.3	34.0	39.1	43.6	45.8
Subway		2.0	27.4	29.7	32.2	34.9	37.7	40.8	43.4	44.2	46.5	47.6
Taxi		10.0	2.7	3.5	4.7	5.4	7.1	10.1	12.4	16.4	19.3	21.4
Communications	1.200	100.0	22.4	24.5	26.7	28.4	30.8	33.1	35.6	38.4	40.6	43.2
Postal		40.7	20.7	23.4	25.9	27.3	29.8	32.0	34.9	37.1	39.2	41.9
Telegraph		9.8	42.2	45.8	49.6	53.5	55.1	55.7	56.6	62.3	61.2	63.2
Telephone		36.8	23.2	24.4	26.1	27.2	28.8	30.8	32.5	34.5	37.0	39.0
Radio-TV		12.7	10.3	12.0	13.6	16.5	20.8	25.7	30.7	35.2	39.6	44.3
Repair and personal care	5.497	100.0	42.1	42.9	43.7	44.6	45.6	46.6	45.4	45.0	48.0	55.3
State services		83.1	8.9	9.8	10.8	11.8	13.0	14.3	12.9	12.4	16.0	24.8
Private services		16.9	202.5	202.5	202.5	202.5	202.5	202.5	202.5	202.5	202.5	202.5
Recreation	2.608	100.0	37.6	39.9	42.4	44.4	49.6	57.6	60.8	63.6	68.5	70.3
Entertainment		58.8	25.4	30.0	34.3	35.6	42.9	54.2	60.9	66.0	73.0	75.6
Resorts		17.6	36.9	38.3	40.5	42.4	44.4	48.0	47.9	49.2	54.9	57.0
Leisure		23.8	68.7	65.9	64.4	68.2	70.6	74.3	71.3	69.6	69.1	68.4
Goods and household services	188.090		32.9	33.6	36.2	39.6	42.3	45.3	47.7	51.5	55.3	57.6
Communal services	22.993		41.4	42.3	43.8	45.6	48.3	51.1	52.8	54.7	56.9	59.3
Education	14.380	100.0	42.8	43.8	45.1	46.3	48.3	50.3	51.8	53.1	54.7	56.4
Labor		71.3	47.2	48.8	50.4	51.7	54.0	56.2	57.0	58.1	59.5	60.8
Other current purchases		28.7	31.7	31.3	32.0	32.9	33.9	35.6	38.8	40.6	42.6	45.3
Health	8.613	100.0	39.0	39.8	41.7	44.5	48.5	52.5	54.5	57.4	60.6	64.1
Labor		63.1	44.0	45.8	47.6	49.3	52.7	56.0	57.6	60.2	63.4	66.4
Other current purchases		36.9	30.5	29.5	31.5	36.2	41.2	46.3	49.2	52.7	55.7	60.2

Table A-1 (continued)

1970 = 100

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	**60.9**	**62.7**	**65.5**	**68.2**	**69.8**	**74.0**	**78.6**	**83.8**	**89.5**	**95.0**
Goods	61.6	63.2	65.8	68.3	69.2	73.2	77.8	83.3	89.2	94.9
Food	65.5	67.0	69.8	73.5	73.5	77.2	80.8	85.8	90.9	96.3
Animal products	69.1	69.7	71.1	78.3	71.6	75.4	81.2	86.4	92.3	97.2
Fish	56.7	58.8	62.5	67.7	74.4	77.8	80.6	83.3	91.1	101.7
Meat	73.6	72.9	75.4	84.2	74.4	81.2	88.2	93.1	98.1	97.0
Milk	67.2	70.7	70.8	79.7	66.0	61.5	67.8	75.4	82.6	98.3
Butter	69.0	70.8	70.2	71.0	75.7	79.5	78.9	82.2	90.5	98.4
Cheese	40.6	42.7	47.5	48.3	57.5	64.9	73.6	76.2	81.6	90.2
Eggs	65.5	62.5	61.2	63.8	66.8	74.2	79.8	84.4	88.9	92.2
Processed foods	61.8	64.7	68.9	71.7	78.4	81.9	82.8	87.6	91.3	96.1
Sugar	64.6	68.3	71.4	76.3	77.6	84.8	90.0	94.4	96.2	96.8
Vegetable oil	68.8	74.0	79.2	84.5	91.2	99.3	89.1	92.9	93.8	96.2
Margarine	65.2	65.2	67.0	75.7	85.7	78.4	78.8	81.5	87.0	96.4
Confectioneries	56.0	58.2	63.2	65.8	74.5	75.7	75.0	80.7	86.9	95.0
Macaroni	80.8	80.7	87.8	63.0	94.5	91.3	90.8	93.6	91.5	100.0
Basic foods	84.1	84.9	86.8	84.7	88.3	90.8	90.5	93.2	96.4	95.2
Potatoes	97.1	98.8	99.7	100.6	101.2	103.9	99.9	97.9	98.9	99.9
Vegetables	75.3	73.4	74.6	71.2	84.8	83.5	85.6	94.8	94.6	91.8
Fruit	55.5	56.2	62.2	65.1	68.0	76.1	74.1	81.8	92.9	85.2
Flour and groats	93.6	94.5	95.7	90.9	92.6	94.1	95.1	95.4	97.4	98.7
Beverages and tobacco	47.0	49.9	55.0	58.6	62.1	66.6	71.6	78.2	84.4	95.8
Alcohol and soft drinks	46.1	49.2	54.7	58.3	61.7	66.4	71.4	78.1	84.3	96.1
Tea	53.5	54.4	62.7	69.5	71.7	66.9	76.7	80.7	80.6	91.0
Tobacco	53.7	55.2	56.2	59.1	63.5	68.7	72.6	79.1	86.2	94.5

Soft goods	57.0	58.9	60.9	61.2	63.1	67.4	73.4	79.9	86.9	93.5
Cotton fabrics	126.2	112.9	107.9	103.4	101.3	99.8	105.0	109.4	108.9	107.7
Wool fabrics	109.3	101.5	92.5	84.1	83.2	96.4	97.2	97.8	103.3	104.3
Silk fabrics	87.9	84.3	89.6	89.2	85.0	96.2	103.9	106.8	101.8	98.0
Linen fabrics	66.9	64.0	57.1	55.1	55.6	69.7	82.4	88.1	97.6	101.4
Sewn goods	53.0	56.6	58.7	57.5	56.2	56.1	61.6	70.6	81.3	90.6
Hosiery	72.0	74.8	77.2	83.8	92.4	100.9	107.9	111.0	109.6	104.3
Leather shoes	59.6	63.4	66.9	66.6	69.2	74.1	79.4	84.4	89.9	93.7
Rubber footwear	96.1	94.6	90.9	92.3	95.2	93.1	94.9	97.2	97.5	97.0
Felt footwear	99.1	105.0	106.3	107.9	107.9	104.7	102.5	101.3	101.9	100.0
Knitwear	38.7	40.4	42.9	45.7	52.8	61.4	69.1	76.0	83.7	92.6
Haberdashery	46.6	49.9	54.0	54.8	56.6	62.7	68.7	73.8	81.6	90.3
School supplies	38.5	40.0	41.6	43.7	49.5	54.3	60.2	66.2	75.9	87.7
Publications	46.3	48.4	50.8	54.5	57.7	65.7	73.0	80.0	84.4	94.5
Household soap	50.3	52.4	54.1	60.3	61.8	69.4	76.0	85.8	93.4	96.0
Toilet soap	46.0	48.2	51.7	52.1	56.3	60.9	67.4	74.9	82.3	90.8
Durables	47.3	48.1	50.5	50.4	55.4	61.6	68.9	74.8	83.0	89.5
Consumer services	**58.3**	**60.8**	**64.2**	**67.9**	**72.3**	**77.0**	**81.5**	**85.9**	**90.9**	**95.2**
Household services	53.7	55.5	58.6	61.9	66.6	71.8	77.0	82.9	89.0	94.2
Housing	70.6	74.1	77.4	80.5	83.3	86.0	88.8	91.6	94.5	97.3
Urban housing	61.8	65.9	69.7	73.5	77.1	80.7	84.3	88.1	92.1	96.0
Rural housing	81.3	84.2	86.7	88.9	90.8	92.5	94.2	96.0	97.5	98.8
Utilities	45.9	50.4	55.5	60.9	66.5	72.1	77.1	81.9	87.7	93.9
Electricity	42.1	46.9	52.6	58.3	64.5	70.7	75.5	80.9	87.4	93.6
Gas	24.3	29.9	37.3	45.5	55.0	64.7	72.4	74.3	81.1	91.9
Other utilities	53.9	58.0	62.1	66.4	70.7	75.0	79.6	84.4	89.4	94.6
Transportation	40.1	44.0	49.7	54.8	59.3	64.8	72.0	79.1	86.6	93.0
Rail	64.4	66.4	71.3	72.3	73.5	76.0	82.7	88.3	95.7	98.5
Sea	83.7	85.8	83.5	91.0	83.7	92.7	103.3	104.4	110.8	109.7
River	79.1	81.5	85.3	87.0	86.0	90.8	95.0	98.1	100.8	101.7
Bus	30.1	34.2	40.6	47.0	53.2	59.5	67.6	75.6	83.2	90.4
Air	15.5	21.0	26.0	32.4	39.5	48.7	57.7	68.4	79.4	91.4
Tram	98.5	97.7	99.7	101.8	103.3	103.5	102.9	102.1	100.1	98.4
Trolleybus	49.9	51.3	54.8	59.4	64.5	70.2	77.0	82.3	87.1	92.9
Subway	50.0	53.7	56.7	62.8	68.4	72.0	79.4	84.9	90.3	94.8
Taxi	26.5	34.2	43.2	50.6	53.5	59.1	64.4	71.6	81.3	90.8

Table A-1 (continued) 1970 = 100

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Communications	46.5	49.2	52.3	55.3	59.3	65.4	72.3	79.8	85.5	93.0
Postal	45.1	47.7	50.6	54.9	60.8	67.6	75.6	84.0	88.4	94.7
Telegraph	66.1	67.2	69.2	69.8	70.6	74.9	82.2	88.5	92.9	97.9
Telephone	41.9	44.7	47.9	49.9	52.6	59.2	65.4	72.7	79.9	89.7
Radio-TV	48.9	53.3	57.3	61.3	64.9	69.1	74.0	79.8	86.6	93.3
Repair and personal care	53.8	50.1	49.9	51.5	56.5	63.5	70.3	77.7	85.4	91.7
State services	27.5	30.3	33.4	36.9	43.8	53.2	60.6	69.9	79.5	90.5
Private services	180.4	146.0	129.7	121.6	118.0	113.0	117.2	115.3	113.8	97.6
Recreation	73.0	75.9	77.8	78.2	84.4	87.7	88.2	93.6	97.6	98.6
Entertainment	77.7	82.8	84.5	83.5	88.7	92.0	90.2	96.6	101.1	100.1
Resorts	61.0	60.7	64.0	65.2	77.7	82.0	86.3	89.7	92.9	97.0
Leisure	71.5	71.6	72.7	75.8	79.5	82.1	84.7	89.3	92.7	96.2
Goods and household services	60.7	62.3	65.0	67.5	68.9	73.1	77.7	83.3	89.2	94.9
Communal services	62.6	65.8	69.4	73.5	77.7	81.9	85.6	88.7	92.7	96.2
Education	59.3	62.9	68.0	72.8	77.8	82.3	86.3	89.6	93.8	97.4
Labor	62.5	65.3	69.9	73.7	78.7	83.3	87.3	90.4	94.2	97.1
Other current purchases	51.2	56.9	63.4	70.4	75.6	79.9	83.8	87.8	92.7	98.0
Health	68.0	70.5	71.7	74.8	77.6	81.3	84.5	87.0	90.8	94.3
Labor	69.4	72.2	75.0	77.2	80.3	83.8	86.9	89.4	93.4	97.1
Other current purchases	65.6	67.6	66.1	70.8	73.1	77.0	80.4	83.0	86.3	89.6

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Consumption	**100.0**	**103.9**	**106.5**	**110.6**	**115.5**	**120.7**	**124.0**	**127.9**	**132.1**	**136.4**
Goods	100.0	103.9	106.2	110.3	115.2	120.4	123.5	127.6	131.5	135.7
Food	100.0	102.2	102.3	105.7	110.9	113.6	114.5	117.0	120.3	123.2
Animal products	100.0	102.1	103.9	109.3	113.5	118.3	118.2	119.7	122.0	125.2
Fish	100.0	97.0	99.9	107.6	111.2	114.3	126.4	118.4	119.5	115.5
Meat	100.0	105.2	108.3	113.6	119.0	124.5	123.4	124.5	127.8	131.1
Milk	100.0	95.9	91.4	88.7	93.5	97.9	96.3	92.2	92.5	97.5
Butter	100.0	97.2	98.5	121.1	113.4	113.6	113.2	130.7	125.3	131.3
Cheese	100.0	96.9	101.0	112.1	118.2	117.6	128.2	137.0	144.6	146.7
Eggs	100.0	110.5	118.6	126.2	133.9	142.4	139.0	148.9	157.0	159.0
Processed foods	100.0	102.3	103.9	110.3	113.5	114.2	119.2	123.6	127.9	130.4
Sugar	100.0	103.5	101.9	108.1	108.9	110.1	113.5	115.2	116.5	117.1
Vegetable oil	100.0	103.9	103.4	110.4	120.6	117.1	119.8	127.1	131.4	134.0
Margarine	100.0	104.7	113.7	128.9	127.5	129.5	140.4	157.7	165.4	171.9
Confectioneries	100.0	100.3	103.3	110.2	115.1	114.9	120.5	126.2	132.8	136.0
Macaroni	100.0	105.9	118.6	110.9	110.7	123.2	134.4	130.2	135.7	143.5
Basic foods	100.0	103.6	99.4	103.3	102.5	102.8	101.0	106.4	108.0	107.1
Potatoes	100.0	99.4	94.9	98.1	96.6	96.8	96.8	98.5	96.9	91.8
Vegetables	100.0	104.6	99.4	106.6	110.2	113.8	110.9	114.5	120.7	127.0
Fruit	100.0	112.5	104.8	117.6	109.8	116.8	117.9	125.0	126.1	117.8
Flour and groats	100.0	101.3	98.9	98.5	99.3	95.8	92.6	99.2	100.8	102.4
Beverages and tobacco	100.0	101.3	101.4	100.0	109.2	114.8	117.6	118.2	124.1	129.7
Alcohol and soft drinks	100.0	100.7	100.1	97.8	107.4	112.5	114.9	114.6	120.6	125.8
Tea	100.0	99.1	104.7	102.4	114.9	126.7	132.9	149.7	153.0	162.6
Tobacco	100.0	106.3	112.3	118.6	123.8	132.4	137.0	142.3	148.5	156.1
Soft goods	100.0	104.7	107.8	111.2	115.2	121.5	127.2	131.4	135.2	140.9
Cotton fabrics	100.0	96.8	92.2	96.3	88.0	86.1	88.0	86.6	87.9	94.6
Wool fabrics	100.0	103.3	116.4	127.1	139.8	152.9	151.3	147.2	163.2	172.6
Silk fabrics	100.0	98.3	114.5	122.9	130.1	182.8	207.3	208.9	182.3	197.9
Linen fabrics	100.0	105.9	110.8	110.5	109.4	99.5	104.4	114.4	119.4	107.4
Sewn goods	100.0	106.3	107.5	109.4	112.5	118.7	123.7	130.8	135.9	141.6
Hosiery	100.0	97.8	99.9	105.4	109.8	111.7	115.1	116.9	119.3	122.3
Leather shoes	100.0	100.0	99.1	100.4	104.5	105.5	109.3	112.5	112.8	112.1
Rubber footwear	100.0	103.5	104.0	112.1	118.5	118.5	117.3	113.9	112.7	112.1
Felt footwear	100.0	99.1	97.2	96.9	95.9	94.7	91.8	89.9	87.4	82.7

Table A-1 (continued)

1970 = 100

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Soft goods (continued)										
Knitwear	100.0	105.2	106.7	110.7	113.0	114.1	116.7	119.2	121.2	123.2
Haberdashery	100.0	110.8	121.2	125.3	131.5	142.9	152.2	164.2	171.3	182.4
School supplies	100.0	111.0	122.4	127.3	137.9	146.6	152.1	162.2	168.6	177.7
Publications	100.0	106.0	112.5	118.7	125.0	134.0	139.8	135.5	144.7	155.2
Household soap	100.0	108.6	119.6	118.6	123.8	136.7	135.8	140.7	147.9	170.5
Toilet soap	100.0	109.9	120.2	129.4	138.8	154.5	169.9	188.0	215.2	243.3
Durables	100.0	113.5	131.0	142.1	154.0	168.9	180.1	196.7	205.0	213.5
Consumer services	**100.0**	**104.1**	**107.8**	**112.0**	**116.9**	**121.7**	**126.0**	**129.1**	**134.2**	**138.9**
Household services	100.0	105.6	111.6	117.6	124.4	131.2	137.5	141.0	147.6	154.5
Housing	100.0	102.7	105.5	108.4	111.2	114.1	116.8	119.5	122.2	124.8
Urban housing	100.0	104.2	108.6	113.1	117.7	122.3	126.7	131.2	135.8	140.2
Rural housing	100.0	101.0	101.9	102.6	103.3	104.0	104.7	105.2	105.7	106.0
Utilities	100.0	106.8	113.8	120.8	128.2	135.7	143.8	149.5	156.6	163.0
Electricity	100.0	107.6	114.8	122.0	129.6	137.4	147.0	152.1	159.0	163.8
Gas	100.0	108.1	120.3	132.4	144.6	156.8	168.9	175.3	188.6	206.0
Other utilities	100.0	105.7	111.5	117.4	123.6	129.8	135.7	141.7	147.8	153.8
Transportation	100.0	106.9	114.8	121.5	131.2	141.2	149.5	148.8	154.6	161.4
Rail	100.0	103.5	107.7	111.8	115.4	117.7	118.7	121.4	125.1	126.3
Sea	100.0	108.0	117.8	122.0	131.2	134.2	152.0	165.9	147.3	154.4
River	100.0	105.0	105.0	108.7	112.4	116.1	110.6	103.2	106.9	106.9
Bus	100.0	106.6	116.4	125.4	137.8	149.9	160.7	170.1	178.6	185.7
Air	100.0	113.6	122.6	126.3	139.1	156.8	167.3	163.0	179.2	193.1
Tram	100.0	100.2	99.9	100.4	101.4	103.4	105.0	105.1	105.3	104.2
Trolleybus	100.0	107.6	113.9	119.2	124.8	130.1	136.5	141.0	143.9	146.1
Subway	100.0	106.5	113.0	118.9	123.6	129.5	140.7	146.3	153.2	160.2
Taxi	100.0	110.4	120.6	129.3	141.9	156.1	169.7	115.4	107.5	121.6

Communications	100.0	107.3	115.2	123.5	132.4	142.0	151.1	159.6	168.4	177.9
Postal	100.0	105.2	110.0	113.7	117.1	121.2	122.7	124.0	124.5	126.6
Telegraph	100.0	102.0	105.6	110.8	115.5	121.5	125.6	130.8	134.7	140.2
Telephone	100.0	110.9	123.1	137.8	154.6	172.1	191.9	210.3	230.5	250.4
Radio-TV	100.0	107.4	116.3	123.0	130.1	137.1	143.2	149.3	155.2	160.7
Repair and personal care	100.0	106.4	113.8	122.0	130.1	138.1	146.3	153.5	164.5	175.9
State services	100.0	107.8	116.7	126.6	136.4	146.0	155.9	164.6	177.8	191.7
Private services	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Recreation	100.0	102.3	103.4	105.4	107.0	108.0	106.3	106.7	109.5	111.4
Entertainment	100.0	100.1	98.3	98.6	98.3	96.9	90.9	88.1	89.7	89.7
Resorts	100.0	104.5	109.2	113.6	117.2	121.8	127.0	131.9	135.0	139.6
Leisure	100.0	105.9	111.1	115.2	120.0	124.4	127.4	132.0	137.6	141.9
Goods and household services	100.0	104.0	106.8	111.1	116.2	121.6	125.1	129.2	133.4	137.8
Communal services	100.0	102.7	104.4	106.7	109.9	112.7	115.2	117.8	121.5	124.3
Education	100.0	102.9	104.2	106.5	109.7	112.7	115.3	118.1	121.7	124.3
Labor	100.0	102.9	105.2	107.1	109.5	111.7	113.8	115.8	119.2	121.7
Other current purchases	100.0	102.9	101.8	105.1	110.0	115.1	118.9	123.5	128.1	130.9
Health	100.0	102.3	104.5	107.0	110.2	112.6	114.9	117.6	121.3	124.3
Labor	100.0	103.4	106.2	108.5	111.3	113.4	115.6	117.1	118.5	121.7
Other current purchases	100.0	100.4	101.6	104.4	108.2	111.2	113.8	118.3	126.1	128.8

Table A-1 (continued)

1970 = 100

	1980
Consumption	**140.4**
Goods	139.5
Food	124.5
Animal products	125.3
Fish	120.7
Meat	129.9
Milk	98.6
Butter	128.3
Cheese	141.4
Eggs	163.7
Processed foods	131.8
Sugar	115.4
Vegetable oil	138.3
Margarine	170.5
Confectioneries	139.9
Macaroni	146.0
Basic foods	105.3
Potatoes	94.2
Vegetables	124.0
Fruit	106.2
Flour and groats	103.2
Beverages and tobacco	135.3
Alcohol and soft drinks	130.9
Tea	183.3
Tobacco	162.6

Soft goods	147.7
Cotton fabrics	94.6
Wool fabrics	170.6
Silk fabrics	233.9
Linen fabrics	109.4
Sewn goods	149.9
Hosiery	124.5
Leather shoes	113.8
Rubber footwear	112.1
Felt footwear	78.6
Knitwear	124.8
Haberdashery	194.0
School supplies	186.5
Publications	165.7
Household soap	181.8
Toilet soap	266.5
Durables	227.9
Consumer services	**143.7**
Household services	161.6
Housing	127.4
Urban housing	144.6
Rural housing	106.5
Utilities	170.4
Electricity	171.3
Gas	220.4
Other utilities	159.6
Transportation	167.6
Rail	124.8
Sea	157.2
River	110.6
Bus	192.5
Air	205.4
Tram	103.7
Trolleybus	147.6
Subway	166.6
Taxi	138.7

Table A-1 (continued)

1970 = 100

	1980
Communications	187.9
Postal	129.0
Telegraph	145.6
Telephone	271.3
Radio-TV	166.9
Repair and personal care	188.0
State services	206.3
Private services	100.0
Recreation	114.3
Entertainment	91.7
Resorts	143.5
Leisure	146.0
Goods and household services	142.1
Communal services	126.9
Education	127.8
Labor	126.1
Other current purchases	132.3
Health	125.2
Labor	122.8
Other current purchases	129.4

[a] Because of rounding, components may not add to totals shown.

Table A-2

1970 = 100

Per Capita Consumption in Established Prices, by Category, 1950-80

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Consumption	**45.6**	**45.9**	**48.4**	**51.4**	**54.1**	**56.8**	**58.6**	**61.9**	**65.0**	**66.6**
Goods	44.6	44.7	47.6	51.1	54.0	56.7	58.8	62.7	66.0	67.3
Food	53.3	51.7	55.3	58.7	59.7	63.0	64.6	68.6	72.0	72.5
Animal products	52.5	52.5	53.0	54.8	56.6	57.4	61.1	66.1	73.6	75.6
Processed foods	35.1	45.7	49.8	58.7	47.4	57.5	61.7	62.7	64.4	66.4
Basic foods	97.6	80.1	89.6	92.7	96.1	98.5	95.0	99.0	97.9	97.0
Beverages and tobacco	28.1	30.9	34.0	37.4	41.4	45.7	46.8	50.9	52.6	51.6
Soft goods	33.0	36.8	38.3	41.5	47.6	49.3	52.5	55.0	58.2	60.8
Durables	14.6	16.7	18.8	24.1	30.3	32.5	35.0	41.6	45.0	48.2
Consumer services	**49.4**	**50.1**	**51.3**	**52.4**	**54.6**	**57.1**	**57.9**	**59.2**	**61.4**	**64.0**
Household services	42.6	43.8	45.0	46.0	47.9	50.5	51.2	52.6	55.6	59.3
Housing	64.9	65.5	66.2	66.6	67.5	68.5	69.7	71.5	74.0	77.0
Utilities	33.8	35.3	37.0	38.3	39.8	41.3	42.9	44.3	46.8	49.5
Transportation	18.3	20.1	21.7	23.8	26.2	29.7	31.3	35.1	38.5	41.5
Communications	30.3	32.5	34.9	36.3	38.7	40.9	43.3	45.8	47.7	49.8
Repair and personal care	56.8	56.9	57.0	57.0	57.3	57.7	55.3	53.8	56.4	63.8
Recreation	50.7	52.9	55.4	56.8	62.4	71.3	73.9	75.9	80.5	81.1
Goods and household services	44.3	44.6	47.3	50.6	53.3	56.0	57.9	61.5	64.8	66.4
Communal services	55.8	56.1	57.2	58.3	60.8	63.3	64.2	65.4	66.8	68.4
Education	57.7	58.1	58.9	59.2	60.7	62.3	62.9	63.4	64.2	65.0
Health	52.6	52.8	54.4	56.9	61.0	64.9	66.3	68.6	71.1	73.9
Population										
Million people	180.1	183.0	186.0	190.0	193.0	196.2	199.7	203.2	206.8	210.5
Index, 1970=100	74.2	75.4	76.6	78.3	79.5	80.8	82.2	83.7	85.2	86.7

Table A-2 (continued)

1970 = 100

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Consumption	**69.0**	**69.8**	**71.7**	**73.6**	**74.3**	**77.8**	**81.7**	**86.3**	**91.2**	**959.**
Goods	69.8	70.4	72.1	73.6	73.6	77.0	80.9	85.7	90.9	95.8
Food	74.2	74.5	76.5	79.3	78.2	81.1	84.1	88.3	92.7	97.2
Animal products	78.3	77.5	77.9	84.5	76.2	79.3	84.4	88.9	94.1	98.1
Processed foods	70.1	72.0	75.4	77.4	83.4	86.1	86.1	90.1	93.0	97.0
Basic foods	95.3	94.5	95.0	91.4	94.0	95.5	94.1	95.9	98.2	96.1
Beverages and tobacco	53.2	55.5	60.2	63.2	66.1	70.0	74.5	80.5	86.0	96.7
Soft goods	64.5	65.6	66.7	66.0	67.2	70.9	76.3	82.2	88.6	94.3
Durables	93.6	53.6	55.3	54.3	58.9	64.7	71.6	76.9	84.5	90.5
Consumer services	**66.0**	**67.7**	**70.3**	**73.2**	**77.0**	**81.0**	**84.7**	**88.4**	**92.6**	**96.1**
Household services	60.8	61.8	64.2	66.7	70.9	75.5	80.1	85.3	90.7	95.0
Housing	80.0	82.5	84.8	86.8	88.7	90.4	92.3	94.3	96.3	98.2
Utilities	52.0	56.1	60.8	65.7	70.7	75.9	80.2	84.3	89.4	94.8
Transportation	45.5	49.0	54.4	59.1	63.1	68.1	74.8	81.3	88.2	93.9
Communications	52.7	54.8	57.2	59.7	63.1	68.8	75.2	82.1	87.1	93.8
Repair and personal care	60.9	55.8	54.7	55.5	60.2	66.8	73.1	79.9	87.0	92.6
Recreation	82.7	84.5	85.2	84.3	89.9	92.3	91.7	96.3	99.4	99.5
Goods and household services	68.8	69.4	71.2	72.9	73.3	76.8	80.8	85.6	90.9	95.7
Communal services	70.9	73.2	76.0	79.3	82.7	86.1	89.1	91.2	94.4	97.1
Education	67.2	70.0	74.5	78.5	82.8	86.5	89.7	92.2	95.5	98.3
Health	77.1	78.5	78.5	80.7	82.6	85.5	87.9	89.5	92.5	95.2
Population										
Million people	214.3	218.1	221.7	225.1	228.1	230.9	233.5	236.0	238.3	240.6
Index, 1970 = 100	88.3	89.8	91.3	92.7	93.9	95.1	96.2	97.2	98.1	99.1

Table A-2 (continued)

1970 = 100

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Consumption	**100.0**	**102.9**	**104.5**	**107.5**	**111.3**	**115.1**	**117.3**	**119.9**	**122.8**	**125.7**
Goods	100.0	102.9	104.2	107.2	110.9	114.9	116.8	119.6	122.2	125.1
Food	100.0	101.3	100.3	102.7	106.0	108.3	108.3	109.6	111.8	113.6
Animal products	100.0	101.2	101.9	106.2	109.3	112.9	111.7	112.2	113.3	115.4
Processed foods	100.0	101.3	101.9	107.2	109.3	109.0	112.7	115.9	118.8	120.2
Basic foods	100.0	102.6	97.5	100.4	98.7	98.1	95.5	99.7	100.3	98.8
Beverages and tobacco	100.0	100.3	99.5	97.2	105.2	109.5	111.1	110.8	115.3	119.6
Soft goods	100.0	103.7	105.8	108.1	110.9	115.9	120.3	123.2	125.6	129.9
Durables	100.0	112.4	128.5	138.1	148.3	161.2	170.3	184.4	190.5	196.8
Consumer services	**100.0**	**103.1**	**105.8**	**109.4**	**112.6**	**116.1**	**119.1**	**121.0**	**127.2**	**128.1**
Household services	100.0	104.6	109.4	114.3	119.8	125.2	130.0	132.2	137.2	142.4
Housing	100.0	101.8	103.5	105.3	107.1	108.8	110.4	112.0	113.5	115.1
Utilities	100.0	105.8	111.6	117.5	123.5	129.4	136.0	140.1	145.5	150.3
Transportation	100.0	105.9	112.6	118.1	126.3	134.7	141.4	139.5	143.7	148.8
Communications	100.0	106.3	113.0	120.0	127.5	135.4	142.8	149.7	156.5	163.9
Repair and personal care	100.0	105.4	111.7	118.6	125.3	131.7	138.3	143.9	152.8	162.2
Recreation	100.0	101.4	101.4	102.4	103.0	103.1	100.5	100.1	101.8	102.7
Goods and household services	100.0	103.1	104.8	108.0	111.9	116.1	118.3	121.1	124.0	127.0
Communal services	100.0	101.7	102.4	103.7	105.8	107.5	108.9	110.5	112.9	114.6
Education	100.0	101.9	102.3	103.6	105.6	107.5	109.0	110.7	113.1	114.6
Health	100.0	101.4	102.5	104.0	106.1	107.4	108.7	110.2	112.7	114.6
Population										
Million people	242.8	245.5	247.5	249.8	252.1	254.5	256.8	259.0	261.3	263.4
Index, 1970 = 100	100.0	100.9	101.9	102.9	103.8	104.8	105.8	106.7	107.6	108.5

Table A-2 (continued)

1970 = 100

	1980
Consumption	**128.4**
Goods	127.6
Food	113.9
Animal products	114.6
Processed foods	120.5
Basic foods	96.3
Beverages and tobacco	123.7
Soft goods	135.0
Durables	208.5
Consumer services	**131.4**
Household services	147.8
Housing	116.5
Utilities	155.9
Transportation	153.3
Communications	171.8
Repair and personal care	171.9
Recreation	104.5
Goods and household services	129.9
Communal services	116.0
Education	116.9
Health	114.5
Population	
Million people	265.5
Index, 1970=100	109.3

Appendix B

Data Used in the Derivation of the Index of Food, Beverages, and Tobacco

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Meat—kg per capita	26.	25.	26.	27.	28.	28.	30.	32.	36.	38.
Fish—kg per capita	7.0	8.1	7.9	8.0	8.8	9.4	9.5	9.6	9.8	9.8
Vegetable oil—kg per capita	2.7	3.2	3.5	4.2	4.7	3.9	4.2	4.4	4.7	5.0
Margarine—production (thousand tons)	192.	226.	277.	338.	392.	399.	437	449.	395.	452.
Margarine—wholesale inventories (thousand tons)	3.3	3.8	4.3	4.9	5.6	6.4	7.0	8.2	6.2	11.8
Margarine—retail inventories (thousand tons)	38.6	41.0	43.6	46.4	49.4	52.5	84.7	105.0	81.5	101.8
Margarine—consumption (thousand tons)	192.	223.	274.	335.	388.	395.	404.	427.	421.	426.
Milk—kg per capita	172.	171.	167.	166.	167.	175.	193.	216.	238.	239.
Milk—total consumption (million tons)	30.977	31.365	31.147	31.485	32.236	34.335	38.542	43.891	49.218	50.309
Milk—used for butter (million tons)	9.379	9.862	10.270	10.550	10.728	12.611	14.984	17.040	17.583	19.097
Milk—used for cheese (million tons)	0.934	1.084	1.164	1.307	1.420	1.690	1.882	1.984	2.163	2.253
Milk—net consumption (million tons)	20.664	20.418	19.713	19.629	20.089	20.035	21.677	24.867	29.472	28.960
Butter—production (thousand tons)	415.	436.	454.	467.	475.	558.	663.	754.	778.	845.
Butter—wholesale inventories (thousand tons)	15.1	15.9	16.7	17.6	18.5	19.5	18.6	31.4	44.4	31.9
Butter—retail inventories (thousand tons)	17.0	17.3	17.6	17.9	18.2	18.6	31.5	44.8	42.6	44.8
Butter—exports (thousand tons)	33.4	22.9	15.7	10.8	7.4	5.1	26.4	49.1	24.7	80.3
Butter—imports (thousand tons)	4.5	4.7	4.9	5.1	5.4	5.6	5.8	8.2	25.2	13.6
Butter—consumption (thousand tons)	386.1	417.1	442.4	459.9	471.4	557.2	630.3	687.0	767.8	788.5
Cheese—production (thousand tons)	73.	85.	91.	102.	111.	132.	147.	155.	169.	176.
Eggs—number per capita	60.	68.	73.	80.	85.	90.	94.	106.	108.	114.
Sugar—kg per capita	11.6	17.4	18.5	22.9	12.6	22.0	23.5	24.0	24.2	25.0
Sugar—total consumption (million tons)	2.089	3.190	3.433	4.346	2.424	4.316	4.693	4.877	5.005	5.262
Sugar—used for confectioneries (million tons)	0.645	0.753	0.836	0.916	0.947	0.903	1.028	1.024	1.089	1.162
Sugar—net consumption (million tons)	1.444	2.438	2.597	3.429	1.477	3.414	3.665	3.853	3.915	4.101
Confectioneries—production (thousand tons)	993.	1,158.	1,286.	1,410.	1,457.	1,389.	1,582.	1,575.	1,676.	1,787.
Confectioneries—index of quality (1970 = 100)	91.4	91.7	92.0	92.4	92.7	93.0	93.3	93.7	94.1	93.5
Confectioneries—adjusted production index (1970 = 100)	31.3	36.7	40.9	45.0	46.6	44.6	51.0	51.0	54.5	57.7
Tea—production (thousand tons)	84.9	94.9	97.7	110.0	110.2	121.0	110.0	112.4	138.2	145.7
Tea—net imports (thousand tons)	3.2	3.4	3.7	3.9	4.2	4.5	9.6	15.3	21.4	25.1
Tea—inventory change (thousand tons)	−1.0	−1.8	−3.1	−5.5	−9.8	−17.3	−1.4	3.6	7.5	18.7
Tea—consumption (thousand tons)	89.1	100.1	104.5	119.5	124.2	142.8	121.0	124.1	152.1	152.1

Appendix B (continued)

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Flour—kg per capita	172.	176.	180.	179.	183.	189.	184.	178.	172.	169.
Flour—total consumption (million tons)	30.977	32.198	33.419	34.029	35.250	37.082	36.745	36.170	35.570	35.574
Flour—used in macaroni (million tons)	0.450	0.507	0.631	0.757	0.870	0.980	0.882	0.979	0.972	0.984
Flour—used in confectioneries (million tons)	0.348	0.405	0.450	0.493	0.510	0.486	0.554	0.551	0.587	0.625
Flour—net consumption (million tons)	30.180	31.285	32.338	32.779	33.871	35.616	35.309	34.639	34.011	33.965
Flour—index of quality (1970 = 100)	84.6	86.4	88.2	89.1	90.0	90.9	91.4	92.0	92.5	93.7
Flour—adjusted index of consumption (1970 = 100)	75.2	79.6	84.0	86.0	89.8	95.4	95.1	93.9	92.7	93.7
Macaroni—deflated retail sales (million 1970 rubles)	157.	184.	241.	301.	355.	379.	346.	389.	418.	401.
Potatoes—kg per capita	241.	107.	152.	163.	167	148.	148.	149.	150.	150.
Vegetables—kg per capita	51	48.	51.	58.	60.	69.	65.	66.	71.	67.
Fruits and berries—kg per capita	11.	12.	12.	13.	15.	17.	14.	23.	22.	22.
Vodka and liquor—consumption (million dekaliters)	62.8	71.1	80.5	91.2	103.2	116.9	122.9	140.2	145.4	137.3
Cognac—consumption (million dekaliters)	0.4	0.5	0.7	1.0	1.3	1.7	1.6	1.2	1.2	1.4
Rum—consumption (million dekaliters)	—	—	—	—	—	—	—	—	—	—
Wine—consumption (million dekaliters)	30.4	34.8	39.7	45.4	52.0	59.4	64.6	69.1	78.7	85.4
Champagne—consumption (million dekaliters)	1.1	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8
Beer—consumption (million dekaliters)	131.0	140.3	150.3	161.0	172.4	184.7	180.7	196.5	199.1	231.9
Nonalcoholic beverages—consumption (million dekaliters)	71.9	82.0	78.9	87.8	104.7	97.8	97.2	115.2	120.1	134.6
Tobacco—deflated retail sales (million 1970 rubles)	814.	864.	915.	996.	1,118.	1,200.	1,268.	1,321.	1,370.	1,423.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Meat kg per capita	40.	39.	40.	44.	38.	41.	44.	46.	48.	47.
Fish kg per capita	9.9	10.1	10.5	11.2	12.2	12.6	12.9	13.2	14.3	15.8
Vegetable oil kg per capita	5.3	5.6	5.9	6.2	6.6	7.1	6.3	6.5	6.5	6.6
Margarine production (thousand tons)	431.	476.	516.	566.	606.	670.	599.	624.	652.	691.
Margarine wholesale inventories (thousand tons)	7.3	9.8	9.2	9.4	7.3	16.0	19.6	32.4	35.4	25.2
Margarine retail inventories (thousand tons)	54.7	45.0	65.4	70.7	43.9	124.3	136.1	143.6	147.9	135.0
Margarine consumption (thousand tons)	483.	483.	496.	560.	635.	581.	584.	604.	645.	714.
Milk kg per capita	240.	248.	250.	259.	238.	251.	260.	274.	285.	304.
Milk total consumption (million tons)	51.432	54.160	55.510	58.230	54.288	57.956	60.710	64.664	67.915	73.142
Milk used for butter (million tons)	19.165	20.204	21.244	19.978	21.515	26.758	26.148	26.600	26.329	24.069
Milk used for cheese (million tons)	2.483	2.611	2.906	2.957	3.520	3.968	4.506	4.659	4.992	5.517
Milk net consumption (million tons)	29.784	31.344	31.360	35.295	29.253	27.229	30.056	33.405	36.595	43.557
Butter production (thousand tons)	848.	894.	940.	884.	952.	1,184.	1,157.	1,177.	1,165.	1,065.
Butter wholesale inventories (thousand tons)	35.1	40.8	45.7	32.4	61.8	174.1	388.8	532.7	537.2	333.5
Butter retail inventories (thousand tons)	33.4	29.6	60.9	49.7	48.5	135.5	85.5	77.5	86.4	109.5
Butter exports (thousand tons)	37.2	55.6	69.7	65.0	25.3	43.0	54.1	63.4	75.6	74.3
Butter imports (thousand tons)	4.0	7.8	3.3	2.8	4.2	5.8	2.3	2.2	2.4	2.0
Butter consumption (thousand tons)	823.0	844.3	837.4	846.3	902.7	947.5	940.5	979.9	1,078.4	1,173.3
Cheese production (thousand tons)	194.	204.	227.	231.	275.	310.	352.	364.	390.	431.
Eggs number per capita	118.	111.	107.	109.	113.	124.	132.	138.	144.	148.
Sugar kg per capita	28.0	29.0	30.0	31.5	32.2	34.2	35.3	36.7	37.4	37.8
Sugar total consumption (million tons)	6.000	6.325	6.651	7.091	7.345	7.897	8.243	8.661	8.912	9.095
Sugar used for confectioneries (million tons)	1.134	1.174	1.267	1.340	1.499	1.505	1.455	1.543	1.658	1.979
Sugar net consumption (million tons)	4.867	5.151	5.383	5.751	5.846	6.392	6.788	7.118	7.254	7.297
Confectioneries production (thousand tons)	1,744.	1,806.	1,950.	2,061.	2,306.	2,315.	2,238.	2,374.	2,551.	2,765.
Confectioneries index of quality (1970 = 100)	93.0	93.4	93.8	92.5	93.6	94.7	97.0	98.4	98.6	99.5
Confectioneries adjusted production index (1970 = 100)	56.0	58.2	63.2	65.8	74.5	75.7	75.0	80.7	86.9	95.0
Tea production (thousand tons)	163.7	161.6	178.9	195.6	193.7	197.0	238.2	234.4	229.0	244.6
Tea net imports (thousand tons)	17.3	9.2	8.6	14.4	23.7	25.2	9.4	12.8	9.1	15.2
Tea inventory change (thousand tons)	17.3	4.5	−4.1	−2.4	−1.9	17.8	13.2	0.4	−8.4	−18.5
Tea consumption (thousand tons)	163.7	166.3	191.6	212.4	219.3	204.4	234.4	246.8	246.5	278.3

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Flour—kg per capita	164.	163.	162.	161.	159.	156.	153.	150.	149.	149.
Flour—total consumption (million tons)	35.145	35.550	35.915	36.241	36.268	36.020	35.725	35.400	35.507	35.849
Flour—used in macaroni (million tons)	1.030	1.022	1.078	1.160	1.293	1.280	1.123	1.181	1.087	1.199
Flour—used in confectioneries (million tons)	0.610	0.632	0.682	0.721	0.807	0.810	0.783	0.831	0.893	0.968
Flour—net consumption (million tons)	33.505	33.396	34.155	34.360	34.168	33.930	33.819	33.389	33.526	33.683
Flour—index of quality (1970 = 100)	94.9	95.0	95.1	89.8	92.0	94.1	95.5	97.0	98.7	99.4
Flour—adjusted index of consumption (1970 = 100)	93.6	94.8	95.7	90.9	92.6	94.1	95.1	95.4	97.4	98.7
Macaroni—deflated retail sales (million 1970 rubles)	439.	438.	477.	342.	513.	496.	493.	508.	497.	543.
Potatoes—kg per capita	143.	143.	142.	141.	140.	142.	135.	131.	131.	131.
Vegetables—kg per capita	70.	67.	67.	63.	74.	72.	73.	80.	79.	76.
Fruits and berries—kg per capita	22.	22.	24.	25.	25.	28.	27.	29.	33.	30.
Vodka and liquor—consumption (million dekaliters)	137.8	145.3	161.5	168.5	176.8	188.7	197.2	211.6	224.8	236.4
Cognac—consumption (million dekaliters)	1.7	2.0	2.2	2.5	2.7	3.2	4.0	4.9	5.8	6.7
Rum—consumption (million dekaliters)	0.0	0.6	0.3	0.3	0.4	0.6	0.3	0.4	0.8	0.7
Wine—consumption (million dekaliters)	102.9	111.7	129.4	151.0	165.7	177.9	202.9	232.0	257.2	351.7
Champagne—consumption (million dekaliters)	3.0	3.2	3.5	3.7	4.1	4.5	4.9	5.4	5.8	6.4
Beer—consumption (million dekaliters)	252.1	269.3	284.3	282.4	284.7	318.8	346.6	364.1	385.4	399.0
Nonalcoholic beverages—consumption (million dekaliters)	141.5	142.8	149.0	155.0	161.9	168.8	184.0	200.6	218.7	238.3
Tobacco—deflated retail sales (million 1970 rubles)	1,492.	1,534.	1,563.	1,642.	1,764.	1,909.	2,019.	2,198.	2,397.	2,627.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Meat kg per capita	48.	50.	51.	53.	55.	57.	56.	56.	57.	58.
Fish kg per capita	15.4	14.8	15.1	16.1	16.5	16.8	18.4	17.1	17.1	16.4
Vegetable oil kg per capita	6.8	7.0	6.9	7.3	7.9	7.6	7.7	8.1	8.3	8.4
Margarine production (thousand tons)	762.	850.	850.	883.	997.	999.	1,040.	1,168.	1,225.	1,273.
Margarine wholesale inventories (thousand tons)	28.3	56.4	31.0	26.7	52.9	49.7	49.7	49.7	49.7	49.7
Margarine retail inventories (thousand tons)	153.3	199.3	232.6	165.0	191.8	234.7	234.7	234.7	234.7	234.7
Margarine consumption (thousand tons)	741.	776.	842.	955.	944.	959.	1,040.	1,168.	1,225.	1,273.
Milk kg per capita	307.	301.	296.	307.	315.	316.	316.	321.	318.	319.
Milk total consumption (million tons)	74.540	73.775	73.260	76.689	79.411	80.422	81.149	83.139	83.093	84.025
Milk used for butter (million tons)	24.114	25.357	26.578	30.510	30.736	29.832	30.646	33.900	33.267	31.843
Milk used for cheese (million tons)	6.118	5.926	6.182	6.861	7.232	7.194	7.846	8.384	8.845	8.973
Milk net consumption (million tons)	44.307	42.491	40.500	39.318	41.443	43.396	42.657	40.855	40.981	43.208
Butter production (thousand tons)	1,067.	1,122.	1,176.	1,350.	1,360.	1,320.	1,356.	1,500.	1,472.	1,409.
Butter wholesale inventories (thousand tons)	134.8	97.5	114.4	192.2	181.8	165.6	165.6	165.6	165.6	165.6
Butter retail inventories (thousand tons)	112.3	91.2	66.1	106.3	118.0	91.4	91.4	91.4	91.4	91.4
Butter exports (thousand tons)	73.0	24.3	16.3	17.5	18.3	20.0	16.5	17.8	17.6	17.9
Butter imports (thousand tons)	2.2	2.2	6.2	229.7	10.9	11.6	9.6	75.7	38.9	174.2
Butter consumption (thousand tons)	1,192.1	1,158.3	1,174.0	1,444.2	1,351.4	1,354.3	1,349.1	1,557.9	1,493.3	1,565.3
Cheese production (thousand tons)	478.	463.	483.	536.	565.	562.	613.	655.	691.	701.
Eggs number per capita	159.	174.	185.	195.	205.	216.	209.	222.	232.	233.
Sugar kg per capita	38.8	39.5	38.8	40.8	41.0	40.9	41.9	42.4	42.8	42.8
Sugar total consumption (million tons)	9.421	9.681	9.603	10.192	10.336	10.409	10.760	10.982	11.184	11.274
Sugar used for confectioneries (million tons)	1.882	1.878	1.925	2.044	2.124	2.111	2.202	2.295	2.403	2.450
Sugar net consumption (million tons)	7.538	7.803	7.678	8.148	8.213	8.298	8.558	8.686	8.781	8.824
Confectioneries production (thousand tons)	2,896.	2,890.	2,961.	3,144.	3,267.	3,247.	3,387.	3,531.	3,697.	3,769.
Confectioneries index of quality (1970 = 100)	100.0	100.5	101.0	101.5	102.0	102.5	103.0	103.5	104.0	104.5
Confectioneries adjusted production index (1970 = 100)	100.0	100.3	103.3	110.2	115.1	114.9	120.5	126.2	132.8	136.0
Tea production (thousand tons)	272.7	280.2	291.1	305.4	329.9	352.3	375.4	434.2	453.8	480.1
Tea net imports (thousand tons)	19.3	31.6	35.9	24.8	35.3	49.8	45.9	38.5	28.8	32.1
Tea inventory change (thousand tons)	−13.7	8.7	7.0′	17.3	13.8	14.8	15.0	15.0	15.0	15.0
Tea consumption (thousand tons)	305.7	303.1	320.0	312.9	351.4	387.3	406.3	457.7	467.6	497.2

Appendix B (continued)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Flour—kg per capita	149.	149.	145.	143.	142.	141.	141.	139.	140.	139.
Flour—total consumption (million tons)	36.177	36.520	35.887	35.721	35.798	35.884	36.209	36.001	36.582	36.613
Flour—used in macaroni (million tons)	1.211	1.218	1.359	1.373	1.252	1.368	1.510	1.525	1.487	1.533
Flour—used in confectioneries (million tons)	1.014	1.011	1.036	1.100	1.143	1.136	1.185	1.236	1.294	1.319
Flour—net consumption (million tons)	33.952	34.290	33.493	33.248	33.403	33.380	33.513	33.240	33.801	33.760
Flour—index of quality (1970 = 100)	100.0	100.3	100.3	100.5	100.9	97.5	93.8	101.3	101.3	103.0
Flour—adjusted index of consumption (1970 = 100)	100.0	101.3	98.9	98.5	99.3	95.8	92.6	99.2	100.8	102.4
Macaroni—deflated retail sales (million 1970 rubles)	543.	575.	644.	602.	601.	669.	730.	707.	737.	779.
Potatoes—kg per capita	130.	128.	121.	124.	121.	120.	119.	120.	117.	110.
Vegetables—kg per capita	82.	85.	80.	85.	87.	89.	86.	88.	92.	96.
Fruits and berries—kg per capita	35.	39.	36.	40.	37.	39.	39.	41.	41.	38.
Vodka and liquor—consumption (million dekaliters)	237.9	230.7	217.1	244.4	257.7	261.4	265.1	269.6	283.7	296.0
Cognac—consumption (million dekaliters)	7.5	7.6	7.7	7.8	7.9	8.1	7.6	7.7	8.1	8.5
Rum—consumption (million dekaliters)	0.4	0.9	2.0	1.4	1.1	1.2	1.2	1.3	1.4	1.4
Wine—consumption (million dekaliters)	382.0	400.1	413.9	314.4	382.3	421.7	436.1	413.3	434.9	453.8
Champagne—consumption (million dekaliters)	6.9	7.2	7.4	7.7	7.9	8.2	8.5	8.8	9.3	9.7
Beer—consumption (million dekaliters)	421.2	443.5	472.4	511.0	543.4	575.1	597.8	626.4	659.2	687.8
Nonalcoholic beverages—consumption (million dekaliters)	259.8	267.0	275.0	283.0	291.5	300.2	309.2	318.5	335.2	349.7
Tobacco—deflated retail sales (million 1970 rubles)	2,780.	2,954.	3,122.	3,296.	3,441.	3,681.	3,808.	3,957.	4,127.	4,339.

	1980
Meat—kg per capita	57.
Fish—kg per capita	17.0
Vegetable oil—kg per capita	8.6
Margarine—production (thousand tons)	1,263.
Margarine—wholesale inventories (thousand tons)	49.7
Margarine—retail inventories (thousand tons)	234.7
Margarine—consumption (thousand tons)	1,263.
Milk—kg per capita	314.
Milk—total consumption (million tons)	83.367
Milk—used for butter (million tons)	31.030
Milk—used for cheese (million tons)	8.653
Milk—net consumption (million tons)	43.684
Butter—production (thousand tons)	1,373.
Butter—wholesale inventories (thousand tons)	165.6
Butter—retail inventories (thousand tons)	91.4
Butter—exports (thousand tons)	17.9
Butter—imports (thousand tons)	174.2
Butter—consumption (thousand tons)	1,529.3
Cheese—production (thousand tons)	676.
Eggs—number per capita	238.
Sugar—kg per capita	42.2
Sugar—total consumption (million tons)	11.204
Sugar—used for confectioneries (million tons)	2.508
Sugar—net consumption (million tons)	8.696
Confectioneries—production (thousand tons)	3,859.
Confectioneries—index of quality (1970 = 100)	105.0
Confectioneries—adjusted production index (1970 = 100)	139.9
Tea—production (thousand tons)	530.5
Tea—net imports (thousand tons)	40.0
Tea—inventory change (thousand tons)	10.0
Tea—consumption (thousand tons)	560.5
Flour—kg per capita	139.
Flour—total consumption (million tons)	36.904
Flour—used in macaroni (million tons)	1.534
Flour—used in confectioneries (million tons)	1.351
Flour—net consumption (million tons)	34.019

Appendix B (continued)

	1980
Flour—index of quality (1970 = 100)	103.0
Flour—adjusted index of consumption (1970 = 100)	103.2
Macaroni—deflated retail sales (million 1970 rubles)	793.
Potatoes—kg per capita	112.
Vegetables—kg per capita	93.
Fruits and berries—kg per capita	34.
Vodka and liquor—consumption (million dekaliters)	—
Cognac—consumption (million dekaliters)	—
Rum—consumption (million dekaliters)	—
Wine—consumption (million dekaliters)	285.0
Champagne—consumption (million dekaliters)	—
Beer—consumption (million dekaliters)	650.0
Nonalcoholic beverages—consumption (million dekaliters)	—
Tobacco—deflated retail sales (million 1970 rubles)	4,521.

Appendix C

Data Used in the Derivation of the Index of Soft Goods

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Cotton textiles—retail sales (million rubles)	2,477	2,487.	2,589.	2,753.	2,827.	2,543.	2,558.	2,324.	2,215.	2,353.
Cotton textiles—price index (1940 = 100)	249.	243.	243.	214.	182.	176.	176.	176.	176.	176.
Cotton textiles—deflated retail sales (million 1970 rubles)	1,247.	1,298.	1,351.	1,632.	1,970.	1,833.	1,844.	1,675.	1,596.	1,696.
Wool textiles—retail sales (million rubles)	921.	798.	706.	814.	969.	744.	986.	1,253.	1,366.	1,380.
Wool textiles—price index (1940 = 100)	190.	185.	184.	176.	174.	173.	173.	173.	173.	173.
Wool textiles—deflated retail sales (million 1970 rubles)	564.	502.	447.	538.	648.	581.	663.	843.	919.	928.
Silk textiles—retail sales (million rubles)	446.	538.	657.	860.	1,143.	1,162.	1,416.	1,754.	1,808.	1,735.
Silk textiles—price index (1970 = 100)	186.	184.	184.	176.	171.	170.	169.	168.	168.	168.
Silk textiles—deflated retail sales (million 1970 rubles)	225.	275.	336.	459.	628.	643.	788.	982.	1,612.	971.
Linen textiles—retail sales (million rubles)	136.	127.	119.	111.	118.	117.	159.	207.	230.	235.
Linen textiles—price index (1970 = 100)	127.6	127.1	126.6	125.8	125.0	116.0	116.0	116.0	115.3	115.3
Linen textiles—deflated retail sales (million 1970 rubles)	80.	75.	70.	66.	70.	75.	102.	133.	149.	152.
Sewn goods—production index (1970 = 100)	19.5	22.2	24.9	27.8	33.1	36.6	40.3	40.7	44.5	49.2
Hosiery—production (million pair)	472.7	597.8	584.9	611.9	674.8	772.2	803.2	844.7	887.7	926.1
Leather shoes—production (million pair)	203.0	248.1	241.2	237.5	255.5	271.2	287.0	317.3	356.4	389.9
Leather shoes—wholesale inventory change (million pair)	1.0	1.0	1.0	1.0	1.0	1.0	0.5	−1.3	1.4	1.5
Leather shoes—retail inventory change (million pair)	1.0	1.0	1.0	1.0	1.0	1.0	1.6	0.7	9.1	17.0
Leather shoes—net imports (million pair)	6.6	4.4	3.0	2.0	1.3	0.9	11.4	11.8	24.5	26.1
Leather shoes—consumption (million pair)	207.6	250.5	242.2	237.5	254.8	270.1	296.3	329.7	370.4	397.5
Rubber footwear—production (million pair)	110.8	115.9	121.2	126.8	132.6	138.6	145.0	150.7	159.2	167.4
Felt footwear—production (million pair)	22.4	22.9	23.3	23.8	24.1	24.5	24.2	26.4	28.6	31.1
Knit underwear—production (million units)	150.4	193.3	234.9	274.7	327.1	346.5	348.5	374.7	398.1	399.3
Knit outerwear—production (million units)	47.1	58.9	63.5	66.0	75.5	85.2	85.4	90.2	97.1	97.2
Haberdashery—retail sales (million rubles)	640.	684.	741.	813.	943.	1,035.	1,150.	1,381.	1,523.	1,643.
Haberdashery—price index (1940 = 100)	153.	150.	149.	137.	133.	133.	133.	132.	132.	132.
Haberdashery—deflated retail sales (million 1970 rubles)	505.	551.	601.	717.	857.	940.	1,045.	1,264.	1,394.	1,504.

Appendix C (continued)

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
School and office supplies—retail sales (million rubles)	199.	217.	243.	260.	273.	275.	307.	337.	363.	392.
School and office supplies—price index (1940 = 100)	138.	134.	134.	121.	107.	104.	104.	104.	104.	104.
School and office supplies—deflated retail sales (million 1970 rubles)	113.	126.	142.	168.	199.	206.	230.	253.	272.	294.
Publications—retail sales (million rubles)	316.	332.	348.	378.	411.	466.	524.	581.	641.	715.
Household soap—retail sales (million rubles)	294.	289.	273.	263.	280.	263.	290.	306.	326.	328.
Household soap—price index (1970 = 100)	182.3	161.5	143.0	123.3	106.3	103.3	103.1	103.4	103.4	103.1
Household soap—deflated retail sales (million 1970 rubles)	151.	167.	178.	199.	246.	238.	263.	276.	294.	297.
Toilet soap—retail sales (million rubles)	320.	—	312.	—	352.	373.	389.	449.	483.	514.
Toilet soap—price index (1970 = 100)	202.5	—	159.2	—	106.2	101.3	101.3	100.9	101.3	101.3
Toilet soap—deflated retail sales (million 1970 rubles)	153.	170.	190.	247.	321.	357.	372.	431.	462.	492.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Cotton textiles—retail sales (million rubles)	2,380.	2,130.	2,036.	1,950.	1,911.	1,871.	1,914.	1,993.	1,985.	1,963.
Cotton textiles—price index (1940 = 100)	176.	176.	176.	176.	176.	175.	170.	170.	170.	170.
Cotton textiles—deflated retail sales (million 1970 rubles)	1,715.	1,535.	1,467.	1,405.	1,377.	1,356.	1,428.	1,487.	1,481.	1,465.
Wool textiles—retail sales (million rubles)	1,630.	1,488.	1,356.	1,233.	1,220.	1,330.	1,307.	1,316.	1,389.	1,403.
Wool textiles—price index (1940 = 100)	173.	170.	170.	170.	170.	160.	156.	156.	156.	156.
Wool textiles—deflated retail sales (million 1970 rubles)	1,097.	1,019.	928.	844.	835.	968.	975.	982.	1,036.	1,047.
Silk textiles—retail sales (million rubles)	1,718.	1,597.	1,622.	1,559.	1,487.	1,542.	1,589.	1,634.	1,557.	1,499.
Silk textiles—price index (1940 = 100)	161.	156.	149.	144.	144.	132.	126.	126.	126.	126.
Silk textiles—deflated retail sales (million 1970 rubles)	1.003.	962.	1,023.	1,018.	971.	1,098.	1,186.	1,219.	1,162.	1,118.
Linen textiles—retail sales (million rubles)	254.	243.	217.	210.	212.	240.	271.	290.	321.	334.
Linen textiles—price index (1970 = 100)	115.4	115.4	115.4	115.9	115.9	104.7	100.0	100.0	100.0	100.1
Linen textiles—deflated retail sales (million 1970 rubles)	164.	157.	140.	135.	136.	171.	202.	216.	239.	249.
Sewn goods—production index (1970 = 100)	53.0	56.6	58.7	57.5	56.2	56.1	61.6	70.6	81.2	90.6
Hosiery—production (million pair)	964.1	1,000.5	1,032.8	1.121.6	1,236.0	1,350.0	1,444.3	1,485.9	1,466.4	1,395.9
Leather shoes—production (million pair)	419.3	443.2	456.3	462.7	474.7	486.0	523.2	563.2	600.0	638.4
Leather shoes—wholesale inventory change (million pair)	5.4	1.5	1.5	2.9	0.1	−3.2	−1.0	1.9	−0.2	3.1
Leather shoes—retail inventory change (million pair)	17.3	13.1	1.8	9.2	4.4	−12.8	−10.1	6.7	11.6	21.1
Leather shoes—net imports (million pair)	29.7	25.1	25.2	25.6	25.1	27.9	33.7	48.9	54.6	56.2
Leather shoes—consumption (million pair)	426.3	453.7	478.2	476.2	495.3	529.9	568.0	603.5	643.2	670.4
Rubber footwear—production (million pair)	166.2	163.6	157.2	159.6	164.7	161.0	164.2	168.2	168.6	167.8
Felt footwear—production (million pair)	31.5	33.4	33.8	34.3	34.3	33.3	32.6	32.2	32.4	31.8
Knit underwear—production (million units)	471.6	487.7	519.4	554.5	639.8	714.8	770.4	811.8	825.0	821.6
Knit outerwear—production (million units)	111.7	117.8	124.9	132.9	153.4	187.9	222.1	255.4	302.7	363.4
Haberdashery—retail sales (million rubles)	1,724.	1,830.	1,982.	2,009.	2,077.	2,281.	2,500.	2,686.	2,967.	3,284.
Haberdashery—price index (1940 = 100)	123.	122.	122.	122.	122.	121.	121.	121.	121.	121.
Haberdashery—deflated retail sales (million 1970 rubles)	1,694.	1,813.	1,963.	1,990.	2,057.	2,278.	2,497.	2,682.	2,963.	3,279.

Appendix C (continued)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
School and office supplies—retail sales (million rubles)	424.	436.	453.	476.	539.	592.	656.	721.	827.	956.
School and office supplies—price index (1940 = 100)	103.	102.	102.	102.	102.	102.	102.	102.	102.	102.
School and office supplies—deflated retail sales (million 1970 rubles)	321.	334.	347.	364.	412.	453.	502.	552.	633.	732.
Publications—retail sales (million rubles)	759.	794.	832.	894.	947.	1,078.	1,197.	1,312.	1,385.	1,550.
Household soap—retail sales (million rubles)	351.	368.	380.	423.	433.	487.	533.	602.	655.	674.
Household soap—price index (1970 = 100)	100.1	100.7	100.7	100.6	100.6	100.6	100.6	100.7	100.6	100.8
Household soap—deflated retail sales (million 1970 rubles)	328.	341.	352.	393.	402.	452.	495.	558.	608.	625.
Toilet soap—retail sales (million rubles)	535.	566.	605.	613.	658.	716.	792.	880.	965.	1,069.
Toilet soap—price index (1970 = 100)	98.9	99.9	99.5	100.0	99.5	100.0	100.0	99.9	99.7	100.1
Toilet soap—deflated retail sales (million 1970 rubles)	525.	549.	589.	594.	641.	694.	768.	854.	939.	1,035.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Cotton textiles—retail sales (million rubles)	1,822.	1,763.	1,679.	1,755.	1,604.	1,568.	1,604.	1,578.	1,601.	1,723.
Cotton textiles—price index (1940 = 100)	170.	170.	170.	170.	170.	170.	170.	170.	170.	170.
Cotton textiles—deflated retail sales (million 1970 rubles)	1,359.	1,315.	1,253.	1,309.	1,197.	1,170.	1,197.	1,177.	1,195.	1,286.
Wool textiles—retail sales (million rubles)	1,345.	1,389.	1,565.	1,710.	1,880.	2,056.	2,035.	1,980.	2,195.	2,321.
Wool textiles—price index (1940 = 100)	156.	156.	156.	156.	156.	156.	156.	156.	156.	156.
Wool textiles—deflated retail sales (million 1970 rubles)	1,004.	1,036.	1,168.	1,276.	1,403.	1,534.	1,518.	1,477.	1,638.	1,732.
Silk textiles—retail sales (million rubles)	1,530.	1,504.	1,752.	1,881.	1,990.	2,797.	3,171.	3,247.	2,833.	3,076.
Silk textiles—price index (1940 = 100)	126.	126.	126.	126.	126.	126.	126.	128.	128.	128.
Silk textiles—deflated retail sales (million 1970 rubles)	1,142.	1,122.	1,307.	1,403.	1,485.	2,087.	2,366.	2,385.	2,081.	2,259.
Linen textiles—retail sales (million rubles)	329.	349.	365.	364.	360.	327.	345.	379.	396.	357.
Linen textiles—price index (1970 = 100)	100.0	100.1	100.1	100.2	100.0	99.9	100.4	100.7	100.8	101.0
Linen textiles—deflated retail sales (million 1970 rubles)	245.	260.	272.	271.	269.	244.	256.	281.	293.	264.
Sewn goods—production index (1970 = 100)	100.0	106.2	107.5	109.4	112.5	118.7	125.7	130.8	135.9	141.6
Hosiery—production (million pair)	1,338.1	1,309.1	1,336.9	1,411.0	1,469.0	1,495.0	1,540.0	1,564.0	1,596.0	1,636.0
Leather shoes—production (million pair)	678.9	681.9	647.4	666.2	684.0	698.0	724.0	736.0	740.0	740.0
Leather shoes—wholesale inventory change (million pair)	5.2	7.1	−2.0	0.4	−1.1	2.9	—	—	—	—
Leather shoes—retail inventory change (million pair)	18.1	21.6	0.2	6.8	1.4	8.4	10.0	—	—	—
Leather shoes—net imports (million pair)	59.7	62.2	59.6	59.3	63.9	67.6	67.7	69.0	66.8	61.6
Leather shoes—consumption (million pair)	715.3	715.4	708.8	718.3	747.6	754.3	781.7	805.0	806.8	801.6
Rubber footwear—production (million pair)	173.0	179.0	180.0	194.0	205.0	205.0	203.0	197.0	195.0	194.0
Felt footwear—production (million pair)	31.8	31.5	30.9	30.8	30.5	30.1	29.2	28.6	27.8	26.3
Knit underwear—production (million units)	814.4	828.8	842.9	900.4	920.0	955.0	990.0	1,038.0	1,080.0	1,111.0
Knit outerwear—production (million units)	415.2	445.4	450.9	459.7	469.0	466.0	472.0	474.0	474.0	478.0
Haberdashery—retail sales (million rubles)	3,638.	4,031.	4,410.	4,557.	4,785.	5,197.	5,537.	5,975.	6,231.	6,637.
Haberdashery—price index (1940 = 100)	121.	121.	121.	121.	121.	121.	121.	121.	121.	121.
Haberdashery—deflated retail sales (million 1970 rubles)	3,633.	4,025.	4,404.	4,551.	4,778.	5,190.	5,529.	5,967.	6,222.	6,628.

Appendix C (continued)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
School and office supplies—retail sales (million rubles)	1,015.	1,032	1,125.	1,170.	1,238.	1,316.	1,365.	1,456.	1,513.	1,595.
School and office supplies—price index (1940 = 100)	95.	87.	86.	86.	84.	84.	84.	84.	84.	84.
School and office supplies—deflated retail sales (million 1970 rubles)	834.	926.	1,021.	1,062.	1,150.	1,223.	1,268.	1,353.	1,406.	1,482.
Publications—retail sales (million rubles)	1,640.	1,738.	1,845.	1,947.	2,050.	2,197.	2,294.	2,223.	2,374.	2,546.
Household soap—retail sales (million rubles)	697.	753.	827.	820.	857.	946.	940.	974.	1,008.	1,153.
Household soap—price index (1970 = 100)	100.0	99.5	99.2	99.2	99.3	99.3	99.3	99.3	97.8	97.0
Household soap—deflated retail sales (million 1970 rubles)	651.	707.	779.	772.	806.	890.	884.	916.	963.	1,110.
Toilet soap—retail sales (million rubles)	1,176.	1,292.	1,411.	1,520.	1,632.	1,807.	1,983.	2,199.	2,529.	2,844.
Toilet soap—price index (1970 = 100)	100.0	100.0	99.8	99.9	100.0	99.4	99.3	99.5	99.9	99.
Toilet soap—deflated retail sales (million 1970 rubles)	1,140.	1,253.	1,371.	1,475.	1,582.	1,762.	1,937.	2,143.	2,453.	2,774.

	1980
Cotton textiles—retail sales (million rubles)	1,723
Cotton textiles—price index (1940 = 100)	170
Cotton textiles—deflated retail sales (million 1970 rubles)	1,286
Wool textiles—retail sales (million rubles)	2,294
Wool textiles—price index (1940 = 100)	156
Wool textiles—deflated retail sales (million 1970 rubles)	1,712
Silk textiles—retail sales (million rubles)	3,636
Silk textiles—price index (1940 = 100)	128
Silk textiles—deflated retail sales (million 1970 rubles)	2,671
Linen textiles—retail sales (million rubles)	363
Linen textiles—price index (1970 = 100)	100.8
Linen textiles—deflated retail sales (million 1970 rubles)	269
Sewn goods—production index (1970 = 100)	149.9
Hosiery—production (million pair)	1,666.0
Leather shoes—production (million pair)	744.0
Leather shoes—wholesale inventory change (million pair)	0.0
Leather shoes—retail inventory change (million pair)	0.0
Leather shoes—net imports (million pair)	70.0
Leather shoes—consumption (million pair)	814.0
Rubber footwear—production (million pair)	194.0
Felt footwear—production (million pair)	25.0
Knit underwear—production (million units)	1,144.0
Knit outerwear—production (million units)	478.0
Haberdashery—retail sales (million rubles)	7,057.
Haberdashery—price index (1940 = 100)	121.
Haberdashery—deflated retail sales (million 1970 rubles)	7,047.

Appendix C (continued)

	1980
School and office supplies—retail sales (million rubles)	1,674
School and office supplies—price index (1940 = 100)	84
School and office supplies—deflated retail sales (million 1970 rubles)	1,556.0
Publications—retail sales (million rubles)	2,717.0
Household soap—retail sales (million rubles)	1,227
Household soap—price index (1970 = 100)	96.9
Household soap—deflated retail sales (million 1970 rubles)	1,183
Toilet soap—retail sales (million rubles)	3,124
Toilet soap—price index (1970 = 100)	99.7
Toilet soap—deflated retail sales (million 1970 rubles)	3,038

Appendix D

Data Used in the Derivation of the Index of Durables and Miscellaneous Goods

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Nonfood goods—retail sales (million rubles)	14,960.	15,517.	16,807.	19,194.	21,794.	22,660.	24,807.	28,721.	30,762.	32,661.
Nonfood goods—price index (1940 = 100)	165.	157.	156.	145.	134.	134.	133.	133.	133.	132.
Nonfood goods—retail sales (million 1970 rubles)	11,243.	12,255.	13,359.	16,414.	20,168.	20,969.	23,128.	26,777.	28,680.	30,682.
Soft goods—retail sales (million rubles)	11,931.	12,029.	13,190.	14,372.	16,508.	16,601.	18,395.	20,978.	22,241.	23,503.
Soft goods—price index (1970 = 100)	133.	126.	128.	116.	110.	108.	108.	108.	108.	108.
Soft goods—retail sales (million 1970 rubles)	8,947.	9,584.	10,306.	12,428.	15,074	15,402.	17,039.	19,401.	20,574.	21,833.
Durables and miscellaneous goods (million 1970 rubles)	2,295.	2,672.	3,053.	3,986.	5,094.	5,567.	6,089.	7,377.	8,107.	8,848.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Nonfood goods—retail sales (million rubles)	35,800.	36,216.	38,242.	38,596.	40,322.	44,310.	48,101.	53,165.	58,693.	63,742.
Nonfood goods—price index (1940 = 100)	130.	129.	129.	129.	128.	126.	124.	124.	124.	124.
Nonfood goods—retail sales (million 1970 rubles)	34,148.	34,812.	36,760.	37,100.	39,062.	43,607.	48,101.	53,165.	58,693.	63,742.
Soft goods—retail sales (million rubles)	25,708.	25,988.	27,411.	27,687.	28,615.	31,168.	33,720.	37,563.	41,386.	44,967.
Soft goods—price index (1970 = 100)	107.	106.	105.	105.	105.	102.	101.	101.	101.	100.
Soft goods—retail sales (million 1970 Rubles)	24,135.	24,630.	26,062.	26,441.	27,345.	30,574.	33,524.	37,336.	41,133.	44,794.
Durables and miscellaneous goods (million 1970 rubles)	10,012.	10,182.	10,697.	10,659.	11,717.	13,033.	14,577.	15,829.	17,560.	18,948.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Nonfood goods—retail sales (million rubles)	69,040.	74,117.	79,921.	84,500.	90,043.	97,660.	103,037.	109,378.	115,456.	122,932.
Nonfood goods—price index (1940 = 100)	124.	123.	122.	122.	122.	122.	122.	122.	123.	125.
Nonfood goods—retail sales (million 1970 rubles)	69,040.	74,720.	81,231.	85,885.	91,519.	99,261.	104,726.	111,171.	116,395.	121,949.
Soft goods—retail sales (million rubles)	47,872.	50,539.	53,317.	55,416.	58,186.	62,709.	65,776.	69,099.	72,006.	75,870.
Soft goods—price index (1970 = 100)	100.	100.	100.	99.	99.	99.	99.	99.	99.	99.
Soft goods—retail sales (million 1970 rubles)	47,872.	50,696.	53,500.	55,811.	58,920.	63,503.	66,603.	69,534.	72,994.	76,751.
Durables and miscellaneous goods (million 1970 rubles)	21,168.	24,024.	27,731.	30,074.	32,599.	35,758.	38,124.	41,637.	43,401.	45,197.

	1980
Nonfood goods—retail sales (million rubles)	131,033.
Nonfood goods—price index (1940 = 100)	125.
Nonfood goods—retail sales (million 1970 rubles)	129,985.
Soft goods—retail sales (million rubles)	80,794.
Soft goods—price index (1970 = 100)	99.
Soft goods—retail sales (million 1970 rubles)	81,735.
Durables and miscellaneous goods (million 1970 rubles)	48,250.

Appendix E

Data Used in the Derivation of the Index of Household Services

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Housing										
Urban housing										
Endyear stock—useful space (million square meters)	513.0	535.1	557.0	593.9	632.6	672.0	711.0	763.5	832.0	896.0
Endyear stock—living space (million square meters)	342.0	356.7	371.3	395.9	421.7	448.0	474.0	509.0	554.7	597.3
Midyear stock—living space (million square meters)	336.0	349.4	364.0	383.6	408.8	434.9	461.0	491.5	531.8	576.0
Rural housing										
Endyear stock—useful space (million square meters)	725.9	739.8	752.4	754.2	759.8	769.1	784.4	808.4	831.8	872.0
Construction (million square meters)	19.7	20.0	18.9	20.0	23.9	27.9	32.0	45.9	48.2	55.7
Transfers of rural housing to urban housing (million square meters)	0.0	2.5	2.6	14.4	14.6	14.8	12.8	18.0	20.8	11.3
Retirements (million square meters)	0.0	3.6	3.7	3.8	3.8	3.8	3.8	3.9	4.0	4.2
Endyear stock—living space (million square meters)	544.5	554.9	564.3	565.7	569.8	576.8	588.3	606.3	623.8	654.0
Midyear stock—living space (million square meters)	540.0	549.7	559.6	565.0	567.8	573.3	582.6	597.3	615.1	638.9
Total housing										
Midyear stock—living space (million square meters)	876.0	899.0	923.6	948.6	976.6	1,008.2	1,043.6	1,088.8	1,146.9	1,214.9
Utilities										
Household use of electricity (billion kilowatt-hours)	9.251	10.112	11.078	11.928	12.749	13.686	14.603	15.096	15.955	16.859
Household use of natural gas (billion cubic meters)	0.216	0.234	0.239	0.258	0.282	0.337	0.453	0.697	1.053	1.327
Urban public housing										
Midyear stock—living space (million square meters)	222.7	231.4	242.7	252.4	262.7	273.0	284.3	299.4	320.8	347.0
Repair and personal care										
State-provided services										
RSFSR sales (million 1955 rubles)	—	—	—	—	—	443.2	398.8	384.1	494.7	—.
RSFSR sales (million rubles)	—	—	—	—	—	—	—	—	392.5	609.8

State-provided services (continued)										
USSR sales—constant prices (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR sales current prices (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR sales—comparable prices (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR sales (million 1976 rubles)	—	—	—	—	—	—	—	—	—	—
Privately-provided services										
Total sales (million rubles)	3,268.	3,268.	3,268.	3,268.	3,268.	3,268.	3,268.	3,268.	3,268.	3,268.
Housing services (million rubles)	1,387.	1,387.	1,387.	1,387.	1,387.	1,387.	1,387.	1,387.	1,387.	1,387.
Recreation										
Movie admissions (million)	1,144.	1,360.	1,562.	1,625.	1,967.	2,505.	2,824.	3,065.	3,392.	3,512.
Theater admissions (million)	68.	69.	70.	71.	77.	78.	77.	79.	83.	89.
Resort visitors (thousand)	3,745.	3,884.	4,102.	4,299.	4,505.	4,866.	4,859.	4,991.	5,564.	5,780.
Hotel employment (thousand)	53.	51.	50.	53.	55.	58.	57.	57.	57.	58.
Hotel employment (million manhours)	115.	110.	108.	114.	118.	124.	119.	116.	115.	114.
Transportation										
Rail (billion passenger-kilometers)	88.0	98.5	107.4	118.3	129.1	141.4	142.4	153.4	158.4	164.4
Sea (billion passenger-miles)	671.0	679.0	672.0	800.0	783.0	798.0	748.0	764.0	739.0	756.0
River (billion passenger-kilometers)	2.7	2.9	3.0	3.3	3.5	3.6	3.5	3.8	4.0	4.1
Bus (billion passenger-kilometers)	5.2	6.5	8.4	10.5	14.1	20.9	26.4	33.7	42.6	50.8
Air (billion passenger-kilometers)	1.2	1.5	1.7	2.1	2.4	2.8	3.1	4.5	6.4	9.1
Tram (million passengers)	5,157.0	5,379.7	5,612.0	5,853.2	6,104.7	6,367.0	6,416.0	6,812.0	7,195.0	7,450.0
Trolleybus (million passengers)	945.0	1,077.7	1,229.0	1,410.5	1,618.9	1,858.0	2,082.0	2,392.0	2,672.0	2,805.0
Subway (million passengers)	629.0	681.8	739.0	799.9	865.7	937.0	996.0	1,015.0	1,068.0	1,093.0
Taxi (million paid kilometers)	160.1	210.9	277.9	323.5	424.8	600.3	739.0	978.1	1,148.1	1,275.1
Communications										
Postal—number of items (million)	8,732.2	9,856.0	10,885.0	11,471.0	12,533.5	13,459.4	14,695.0	15,604.0	16,486.8	17,623.6
Telephone—long distance calls (million)	103.4	108.0	115.0	119.0	126.0	135.2	143.1	152.0	163.1	171.7
Telephone—urban telephones (thousand)	2,092.0	2,231.0	2,422.0	2,548.0	2,698.0	2,839.0	2,983.0	3,145.0	3,360.0	3,520.0
Telephone—rural telephones (thousand)	221.0	244.0	264.0	289.0	326.0	351.0	383.0	413.0	450.0	503.0
Telegraph—number of telegrams (million)	153.9	167.0	181.0	195.0	201.0	203.2	206.2	227.0	223.2	230.0
Radio and TV—number of radios (million)	3.6	4.8	5.8	7.3	10.0	13.0	16.2	19.1	21.7	24.7
Radio and TV—number of TV sets (million)	0.0	0.1	0.1	0.2	0.4	0.8	1.3	1.8	2.5	3.6
Radio and TV—number of radio relay facilities (million)	9.7	10.6	11.7	13.8	16.4	19.5	22.2	24.8	27.1	29.2

Appendix E (continued)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Housing										
Urban housing										
Endyear stock — useful space (million square meters)	612.0	1,017.0	1,074.0	1,130.0	1,182.0	1,238.0	1,290.0	1,350.0	1,410.0	1,469.0
Endyear stock — living space (million square meters)	638.7	678.0	716.0	753.3	788.0	825.3	860.0	900.0	940.0	979.3
Midyear stock — living space (million square meters)	618.0	658.3	697.0	734.7	770.7	806.7	842.7	880.0	920.0	959.7
Rural housing										
Endyear stock — useful space (million square meters)	907.0	936.7	962.1	984.8	1,003.6	1,020.6	1,041.1	1,059.7	1,073.9	1,088.4
Construction (million square meters)	50.6	46.6	41.1	39.2	35.2	36.9	38.7	38.4	36.0	35.2
Transfers of rural housing to urban housing (million square meters)	9.1	7.8	5.4	5.0	3.6	5.9	2.9	3.1	3.8	1.4
Retirements (million square meters)	6.5	9.1	10.3	11.5	12.8	14.1	15.3	16.7	18.0	19.7
Endyear stock — living space (million square meters	680.2	702.5	721.6	738.6	752.7	765.4	780.8	794.8	805.5	816.3
Midyear stock — living space (million square meters)	667.1	691.4	712.0	730.1	745.6	759.1	773.1	787.8	800.1	810.9
Total housing										
Midyear stock — living space (million square meters)	1,285.1	1,349.7	1,409.0	1,464.7	1,516.3	1,565.7	1,615.8	1,667.8	1,720.1	1,770.6
Utilities										
Household use of electricity (billion kilowatt-hours)	17.358	19.333	21.652	24.025	26.559	29.133	31.105	33.347	35.997	38.576
Household use of natural gas (billion cubic meters)	1.800	2.212	2.757	3.369	4.071	4.787	5.361	5.500	6.000	6.800
Urban public housing										
Midyear stock — living space (million square meters)	374.7	403.0	432.0	462.0	491.7	521.7	553.3	586.7	621.7	657.7
Repair and personal care										
State-provided services										
RSFSR sales (million 1955 rubles)	—	—	—	—	—	—	—	—	—	—
RSFSR sales (million rubles)	676.1	719.5	861.4	—	—	—	—	—	—	—

State-provided services (continued)										
USSR sales constant prices (million rubles)	1,054.2	1,158.2	1,277.3	1,413.7	1,677.3	2,038.3	2,375.0	2,827.3		
USSR sales current prices (million rubles)	1,375.6					2,357.5	2,688.9	3,108.3	3,544.4	4,045.0
USSR sales comparable prices (million rubles)						2,346.9	2,670.5	3,079.7	3,503.4	3,988.8
USSR sales (million 1976 rubles)										
Privately-provided services										
Total sales (million rubles)	2,716.	2,284.	2,062.	1,997.	2,069.	2,056.	2,170.	2,111.	2,036.	1,859.
Housing services (million rubles)	1,040	928.	857.	867.	973.	1,006.	1,081.	1,040.	979.	952.
Recreation										
Movie admissions (million)	3,611	3,859.	3,926.	3,877.	4,123.	4,279.	4,192.	4,495.	4,705.	4,656.
Theater admissions (million)	91	94.	98.	101.	102.	101.	106.	106.	111.	110.
Resort visitors (thousand)	6,182.	6,153.	6,492.	6,609	7,881.	8,310.	8,748.	9,098.	9,417.	9,831.
Hotel employment (thousand)	63.	66.	67.	70.	73.	76.	78.	82.	85.	88.
Hotel employment (million manhours)	119.	120.	121.	127.	133.	137.	141.	149.	155.	161.
Transportation										
Rail (billion passenger-kilometers)	170.8	176.3	189.3	192.0	195.1	201.6	219.4	234.4	254.1	261.3
Sea (billion passenger-miles)	719.0	737.0	717.0	782.0	719.0	796.0	887.0	897.0	952.0	942.0
River (billion passenger-kilometers)	4.3	4.4	4.6	4.7	4.7	4.9	5.2	5.3	5.5	5.5
Bus (billion passenger-kilometers)	61.0	69.3	82.2	95.2	107.7	120.5	137.0	153.0	168.5	183.0
Air (billion passenger-kilometers)	12.1	16.4	20.3	25.3	30.9	38.1	45.1	53.5	62.1	71.5
Tram (million passengers)	7,842.1	7,780.0	7,937.0	8,103.0	8,221.0	8,241.8	8,192.6	8,130.6	7,971.3	7,831.5
Trolleybus (million passengers)	3,054.6	3,139.0	3,353.0	3,638.0	3,947.0	4,298.0	4,712.8	5,039.3	5,330.6	5,689.4
Subway (million passengers)	1,148.3	1,233.0	1,301.0	1,441.0	1,569.0	1,652.4	1,822.2	1,947.3	2,072.0	2,176.2
Taxi (million paid kilometers)	1,576.0	2,038.0	2,569.3	3,012.0	3185.0	3,515.0	3,832.7	4,258.9	4,835.6	5,402.9
Communications										
Postal number of items (million)	18,991.3	20,071.4	21,301.7	23,109.4	25,598.3	28,461.9	31,837.9	35,358.9	37,225.3	39,842.8
Telephone long distance calls (million)	185.0	196.9	210.0	218.2	226.9	256.5	283.0	313.9	342.8	385.7
Telephone urban telephones (thousand)	3,753.0	4,021.0	4,350.0	4,475.0	4,864.0	5,490.0	6,129.0	6,867.0	7,677.0	8,570.0
Telephone rural telephones (thousand)	548.0	598.0	650.0	814.0	893.0	909.0	986.0	1,075.0	1,192.0	1,324.0
Telegraph number of telegrams (million)	240.9	245.0	252.2	254.5	257.3	273.2	299.8	322.8	338.6	356.9
Radio and TV number of radios (million)	27.8	30.5	32.8	35.2	36.7	38.2	39.8	41.8	44.5	46.7
Radio and TV number of TV sets (million)	4.8	6.5	8.3	10.5	12.8	15.7	19.0	22.7	26.8	30.7
Radio and TV number of radio relay facilities (million)	30.8	32.1	33.1	33.8	34.6	35.6	37.0	38.9	41.0	43.4

Appendix E (continued)

	1970	1971	1972	1973	1974	1974	1976	1977	1978	1979
Housing										
Urban housing										
Endyear stock—useful space (million square meters)	1,529.0	1,594.0	1,661.0	1,730.0	1,800.0	1,867.0	1,932.0	2,001.0	2,070.0	2,134.0
Endyear stock—living space (million square meters)	1,019.3	1,062.7	1,107.3	1,153.3	1,200.0	1,244.7	1,288.0	1,334.0	1,380.0	1,422.7
Midyear stock—living space (million square meters)	999.3	1,041.0	1,085.0	1,130.3	1,176.7	1,222.3	1,266.3	1,311.0	1,357.0	1,401.3
Rural Housing										
Endyear stock—useful space (million square meters)	1,100.9	1,110.8	1,119.2	1,127.1	1,134.2	1,143.2	1,148.6	1,154.5	1,158.7	1,163.4
Construction (million square meters)	34.7	34.7	33.2	32.9	33.0	33.6	30.3	30.6	30.2	29.4
Transfers of rural housing to urban housing (million square meters	1.6	2.8	2.5	2.7	3.3	1.9	2.1	1.7	2.9	1.6
Retirements (million square meters)	20.7	22.0	22.2	22.4	22.5	22.7	22.9	23.0	23.1	23.2
Endyear stock—living space (million square meters	825.7	833.1	839.4	845.3	850.6	857.4	861.4	865.9	869.0	872.5
Midyear stock—living space (million square meters)	821.0	829.4	836.3	842.4	848.0	854.0	859.4	863.7	867.5	870.8
Total housing										
Midyear stock—living space (million square meters)	1,820.3	1,870.4	1,921.3	1,972.7	2,024.6	2,076.3	2,125.7	2,174.7	2,224.5	2,272.1
Utilities										
Household use of electricity (billion kilowatt-hours)	41.200	44.327	47.298	50.249	53.391	56.600	60.568	62.675	65.499	67.477
Household use of natural gas (billion cubic meters)	7.400	8.000	8.900	9.800	10.700	11.600	12.500	12.975	13.957	15.247
Urban public housing										
Midyear stock—living space (million square meters)	695.3	734.7	775.0	816.7	859.7	902.3	943.7	985.3	1,028.0	1,069.3
Repair and personal Care										
State-provided services										
RSFSR sales (million 1955 rubles)	—	—	—	—	—	—	—	—	—	—
RSFSR sales (million rubles)	—	—	—	—	—	—	—	—	—	—

State-provided services (continued)										
USSR sales—constant prices (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR sales—current prices (million rubles)	4,480.7	4,838.8	5,159.6	—	—	—	—	—	—	—
USSR sales—comparable prices (million rubles)	4,408.1	4,750.0	5,144.9	5,579.6	6,011.6	6,433.9	6,817.8	—	—	—
USSR sales (million 1976 rubles)		—	—	—	—	6,243.2	6,666.5	7,039.7	7,607.1	8,199.
Privately-provided services										
Total sales (million rubles)	2,000.	2,000	2,000.	2,000.	2,000.	2,000.	2,000.	2,000.	2,000.	2,000.
Housing services (million rubles)	1,071.	1,071.	1,071.	1,071.	1,071.	1,071.	1,071.	1,071.	1,071.	1,071.
Recreation										
Movie admissions (million)	4,652.	4,656.	4,569.	4,583.	4,567.	4,497.	4,211.	4,080.	4,155.	4,151.
Theater admissions (million)	111.	114.	114.	115.	116.	117.	117.	116.	118.	119.
Resort visitors (thousand)	10,138.	10,594.	11,069.	11,517.	11,882.	12,344.	12,875.	13,373.	13,682.	14,154.
Hotel employment (thousand)	92.	96.	101.	106.	110.	114.	117.	127.	127.	131.
Hotel employment (million manhours)	167.	177.	185.	192.	200.	208.	213.	220.	230.	237.
Transportation										
Rail (billion passenger-kilometers)	265.4	274.6	285.8	296.6	306.3	312.5	315.1	322.2	332.1	335.3
Sea (billion passenger-miles)	859.0	928.0	1,012.0	1,048.0	1,127.0	1,153.0	1,306.0	1,425.0	1,265.0	1,326.0
River (billion passenger-kilometers)	5.4	5.7	5.7	5.9	6.1	6.3	6.0	5.6	5.8	5.8
Bus (billion passenger-kilometers)	202.5	215.8	235.6	253.9	279.1	303.6	325.3	344.5	361.5	376.0
Air (billion passenger-kilometers)	78.2	88.8	95.9	98.8	108.8	122.6	130.8	127.5	140.1	151.0
Tram (million passengers)	7,962.1	7,975.1	7,951.7	7,997.5	8,074.2	8,235.4	8,358.0	8,371.5	8,384.1	8,296.4
Trolleybus (million passengers)	6,122.2	6,587.8	6,973.9	7,298.3	7,638.5	7,963.3	8,355.0	8,634.1	8,810.8	8,945.4
Subway (million passengers)	2,294.4	2,443.3	2,591.7	2,727.0	2,836.3	2,972.0	3,228.6	3,355.6	3,515.0	3,675.3
Taxi (million paid kilometers)	5,951.0	6,570.4	7,179.5	7,694.7	8,443.9	9,291.1	10,097.0	6,870.0	6,395.0	7,239.0
Communications										
Postal—number of items (million)	42,092.7	44,288.0	46,298.0	47,872.0	49,280.0	51,008.0	51,661.0	52,174.0	52,385.0	53,296.0
Telephone—long distance calls (million)	430.5	479.0	535.0	604.0	684.0	768.0	868.0	960.0	1,061.0	1,160.0
Telephone—urban telephones (thousand)	9,504.0	10,436.0	11,380.0	12,450.0	13,589.0	14,694.0	15,712.0	16,690.0	17,752.0	18,855.0
Telephone—rural telephones (thousand)	1,483.0	1,642.0	1,819.0	2,013.0	2,236.0	2,473.0	2,710.0	2,948.0	3,192.0	3,440.0
Telegraph—number of telegrams (million)	364.6	372.0	385.0	404.0	421.0	443.0	458.0	477.0	491.0	511.0
Radio and TV—number of radios (million)	48.6	50.8	53.2	54.8	57.1	59.8	61.5	63.3	64.7	66.2
Radio and TV—number of TV sets (million)	34.8	39.3	45.4	49.2	52.5	55.2	57.6	59.9	62.5	64.3
Radio and TV—number of radio relay facilities (million)	46.2	49.1	52.1	55.5	59.0	62.7	66.4	70.2	74.0	77.8

Appendix E (continued)

1970 = 100

	1980
Housing	
Urban housing	
Endyear stock useful space (million square meters)	2,200.0
Endyear stock living space (million square meters)	1,466.7
Midyear stock living space (million square meters)	1,444.7
Rural housing	
Endyear stock useful space (million square meters)	1,168.6
Construction (million square meters)	30.0
Transfers of rural housing to urban housing (million square meters)	1.5
Retirements (million square meters)	23.3
Endyear stock living space (million square meters)	876.4
Midyear stock living space (million square meters)	874.5
Total housing	
Midyear stock living space (million square meters)	2,319.1
Utilities	
Household use of electricity (billion kilowatt-hours)	70.572
Household use of natural gas (billion cubic meters)	16.313
Urban public housing	
Midyear stock living space (million square meters)	1,110.0
Repair and personal care	
State-provided services	
RSFSR sales (million 1955 rubles)	—
RSFSR sales (million rubles)	—

State-provided services (continued)	
USSR sales — constant prices (million rubles)	
USSR sales — current prices (million rubles)	
USSR sales (million 1976 rubles)	8,822.9
Privately-provided services	
Total sales (million rubles)	2,000.
Housing services (million rubles)	1,071.
Recreation	
Movie admissions (million)	4,244.
Theater admissions (million)	122.
Resort visitors (thousand)	14,546.
Hotel employment (thousand)	134.
Hotel employment (million manhours)	244.
Transportation	
Rail (billion passenger-kilometers)	331.2
Sea (billion passenger-miles)	1,350.0
River (billion passenger-kilometers)	6.0
Bus (billion passenger-kilometers)	389.8
Air (billion passenger-kilometers)	160.6
Tram (million passengers)	8,255.0
Trolleybus (million passeners)	9,035.0
Subway (million passengers)	3,823.0
Taxi (million paid kilometers)	8,252.5
Communications	
Postal — number of items (million)	54,307.0
Telephone — long distance calls (million)	1,264.0
Telephone — urban telephones (thousand)	20,043.0
Telephone — rural telephones (thousand)	3,657.0
Telegraph — number of telegrams (million)	531.0
Radio and TV — number of radios (million)	67.7
Radio and TV — number of TV sets (million)	66.6
Radio and TV — number of radio relay facilities (million)	81.6

Appendix F

Data Used in the Derivation of the Index of Communal Services

	1950	1951	1952	1953	1954	1954	1956	1957	1958	1959
Education										
Personnel services										
Education and culture—employment (thousands)	3,315.	3,434.	3,553.	3,647.	3,817.	3,977.	4,103.	4,250.	4,378.	4,556.
Culture—employment (thousands)	279.	289.	299.	307.	322.	335.	346.	358.	369.	384.
Education—employment (thousands)	3,036.	3,145.	3,254.	3,340.	3,495.	3,642.	3,757.	3,892.	4,009.	4,172.
Education and culture—manhours (million)	5,467.9	5,653.0	5,837.2	5,983.8	6,256.4	6,510.0	6,597.8	6,720.6	6,889.6	7,033.0
Culture—manhours (million)	584.8	604.5	624.0	639.5	668.1	694.6	701.6	712.3	729.9	739.0
Education—manhours (million)	4,883.1	5,048.4	5,213.2	5,344.2	5,588.3	5,815.4	5,896.2	6,008.4	6,159.8	6,293.0
Other current outlays										
Kindergartens										
Outlays net of investment (million rubles)	332.1	316.7	310.3	301.6	312.1	355.9	392.3	457.8	512.9	577.7
Other current outlays as a percent of total outlays	72.6	72.5	71.3	68.4	67.8	68.2	68.1	66.8	66.6	66.4
Other current outlays (million rubles)	294.0	280.2	280.2	269.6	282.1	317.1	351.1	401.6	451.0	514.4
General education										
Republic budget non-investment outlays (million rubles)	2,359.0	2,446.5	2,469.6	2,508.2	2,515.8	2,525.3	3,555.0	3,733.3	2,829.2	3,032.0
Republic budget other current outlays (million rubles)	529.2	496.3	447.1	520.2	399.1	407.9	425.0	476.7	501.3	596.8
Republic budget other current outlays as a percent of total outlays	22.4	20.3	18.1	16.8	15.9	16.2	16.6	17.4	17.7	19.7
USSR outlays, less kindergartens (million rubles)	3,040.0	3,129.2	3,165.1	3,223.4	3,272.8	3,354.2	3,452.7	3,762.3	3,868.0	4,435.2
USSR investment outlays, less kindergartens (million rubles)	42.2	40.8	37.7	55.1	74.8	80.3	87.0	123.8	157.2	307.7
USSR outlays net of investment, less kindergartens (million rubles)	2,997.8	3,088.4	3,127.4	3,168.3	3,198.0	3,273.9	3,365.7	3,638.5	3,821.8	4,127.5
USSR other current outlays (million rubles)	598.0	562.3	510.0	480.3	457.8	471.3	494.6	544.7	586.3	698.7
Higher education *(Vuzy)*										
Republic budget outlays net of investment and stipends (million rubles)	158.9	157.2	160.3	166.5	175.8	251.7	269.0	285.7	200.3	672.2

Higher education (continued)										
Republic budget other current outlays (million rubles)	28.4	28.6	28.1	29.1	30.0	44.1	48.0	51.9	55.1	132.1
Republic budget other current outlays as a percent of total outlays	17.9	18.2	17.5	17.5	17.1	17.5	17.8	18.2	18.4	19.7
Specialized education *(tekhnikums)*										
Republic budget outlays net of investment and stipends (million rubles)	153.0	153.0	159.4	1,164.3	181.6	186.5	234.6	316.2	303.4	316.3
Republic budget other current outlays (million rubles)	38.6	38.7	41.5	43.1	46.4	51.0	70.9	92.9	87.3	91.4
Republic budget other current outlays as a percent of total outlays	25.2	25.3	26.0	26.2	25.6	27.3	30.2	29.4	28.8	28.9
Cadre preparation – *Vuzy, technikums* and trade schools										
USSR total outlays (million rubles)	1,807.1	1,747.2	1,799.4	1,911.7	2,237.6	2,307.9	2,401.0	2,396.0	2,333.3	2,371.2
Investment (million rubles)	35.0	30.6	36.8	42.8	78.9	88.0	81.2	91.7	97.0	98.2
Outlays net of investment (million rubles)	1,772.1	1,716.6	1,762.6	1,868.9	2,158.7	2,219.9	2,319.8	2,304.3	2,236.3	2,273.0
Stipends (million rubles)	187.0	—	—	—	—	295.2	317.7	363.1	341.2	584.0
Outlays net of investment and stipends (million rubles)	1,586.5	1,649.0	1,714.0	1,781.5	2,851.7	1,925.1	2,002.7	1,941.8	1,895.5	1,689.6
Republic budget other current outlays (million rubles)	67.0	67.3	69.6	72.2	76.4	95.1	118.9	144.8	142.4	223.5
Republic budget outlays net of investment and stipends (million rubles)	311.9	310.2	319.7	330.8	357.4	438.2	503.6	601.9	602.7	988.5
Republic budget other current outlays as a percent of total	21.5	21.7	21.8	21.8	21.4	21.7	23.6	24.1	23.6	22.6
USSR other current outlays (million rubles)	340.8	372.4	383.7	407.9	461.5	417.8	472.8	467.1	447.9	382.0
All education-total										
Other current outlays (million rubles)	1,232.8	1,214.9	1,173.9	1,157.8	1,201.4	1,206.2	1,318.5	1,423.5	1,491.1	1,595.1
Price index for material expendituìes (1970 = 100)	103.3	103.3	97.6	93.5	94.2	90.1	90.5	93.2	93.1	93.6
Other current outlays (million 1970 rubles)	1,267.2	1,248.5	1,277.0	1,315.0	1,354.6	1,421.9	1,547.9	1,621.8	1,701.6	1,808.9
Health										
Employment – thousands	2,051.	2,139.	2,226.	2,308.	2,468.	2,627.	2,736.	2,892.	3,059.	3,245.
Manhours – million	3,886.8	4,047.7	4,206.1	4,356.9	4,655.5	4,950.7	5,098.6	5,314.8	5,602.1	5,860.0
Republic budget outlays net of investment (million rubles)	1,909.1	1,929.8	1,977.4	2,130.6	2,215.3	2,433.9	2,871.1	3,182.5	3,456.4	3,740.3
Republic budget other current outlays (million rubles)	825.4	799.6	803.1	881.6	882.6	962.5	1,057.4	1,203.6	1,286.0	1,395.4
Republic budget other current outlays as percent of total outlays	43.0	41.1	40.3	41.1	39.7	39.6	37.0	38.1	37.9	38.3
USSR outlays net of investment (million rubles)	2,144	2,170.	2,232.	2,410.	2,857.	3,078.	3,517.	3,770.	3,998.	4,297.
USSR other current outlays (million rubles)	922.0	892.9	900.0	991.1	1,135.1	1,220.3	1,302.3	1,436.5	1,515.3	1,647.4
Price index for material expenditures (1970 = 100)	103.3	103.3	97.6	93.5	94.2	90.1	90.5	93.2	93.1	93.6
Other current outlays (million 1970 rubles)	947.8	917.6	979.0	1,125.7	1,279.9	1,438.6	1,528.8	1,636.7	1,729.2	1,868.2

Appendix F (continued)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Education										
Personnel Services										
Education and culture — employment (thousands)	4,803.	5,165.	5,521.	5,835.	6,235.	6,600.	6,902.	7,187.	7,531.	7,811.
Culture — employment (thousands)	405.	435.	465.	492.	523.	556.	580.	636.	699.	759.
Education — employment (thousands)	4,398.	4,730.	5,056.	5,343.	5,681.	6,044.	6,322.	6,551.	6,832.	7,052.
Education and culture — manhours (million)	7,200.8	7,534.2	8,053.5	8,498.7	9,066.7	9,595.0	10,057.7	10,481.3	10,987.3	11,399.0
Culture — manhours (million)	752.0	776.0	825.7	870.5	929.5	981.4	1,028.4	1,131.0	1,245.7	1,355.0
Education — manhours (million)	6,468.8	6,758.2	7,227.7	7,628.2	8,137.2	8,613.6	9,029.3	9,350.3	9,741.6	10,044.0
Other current outlays										
Kindergartens										
Total outlays net of investment (million rubles)	659.8	781.9	946.5	1,124.1	1,523.8	1,694.6	1,883.2	2,034.6	2,295.6	2,494.8
Other current outlays as a percent of total outlays	66.9	65.9	66.4	65.9	65.3	58.9	57.8	57.1	53.0	53.4.
Other current outlays (million rubles)	621.5	700.0	850.9	1,012.2	1,189.1	1,317.1	1,424.5	1,509.8	1,584.0	1,714.4
General education										
Republic budget non-investment outlays (million rubles)	3,314.5	3,688.7	4,[illegible]0.1	4,280.6	5,650.4	5,637.8	5,813.4	5,982.1	6,421.1	6,638.5
Republic budget other current outlays (million rubles)	699.2	799.4	894.1	966.3	1,022.8	1,077.3	1,061.2	1,106.7	1,173.1	1,208.6
Republic budget other current outlays as a percent of total outlays	21.1	21.7	22.4	22.6	22.0	19.1	18.3	18.5	18.3	18.2
USSR outlays, less kindergartens (million rubles)	5,[illegible]2.2	5,614.2	6,207.9	6,730.3	7,374.7	8,935.6	—	—	—	—
USSR investment outlays, less kindergartens (million rubles)	421.0	512.8	573.3	596.7	585.3	621.3	—	—	—	—
USSR outlays net of investment, less kindergartens (million rubles)	4,581.2	5,101.4	5,634.6	6,133.6	6,789.4	8,314.3	8,750.8	9,125.2	9,894.3	10,364.9
USSR other current outlays (million rubles)	827.2	936.1	1,047.9	1,130.8	1,199.9	1,264.9	1,253.6	1,311.8	1,388.2	1,432.8
Higher education *(Vuzy)*										
Republic budget outlays net of investment and stipends (million rubles)	702.0	743.0	8[illegible].9	755.5	795.2	877.5	931.9	875.6	965.8	1,039.8
Republic budget other current outlays (million rubles)	137.4	145.9	154.8	143.0	151.0	159.3	168.4	154.8	170.6	183.6

Higher education (continued)										
Republic budget other current outlays as a percent of total outlays	19.6	19.6	19.3	18.9	19.0	18.2	18.1	17.7	17.7	17.5
Specialized education (*tekhnikums*)										
Republic budget outlays net of investment and stipends (million rubles)	320.7	335.6	357.8	383.5	415.0	516.9	449.1	466.2	514.5	544.5
Republic budget other current outlays (million rubles)	90.1	90.0	94.5	98.9	102.7	111.3	101.4	96.6	106.6	112.3
Republic budget other current outlays as a percent of total outlays	28.1	26.8	26.4	25.8	24.7	21.5	22.6	20.7	20.7	20.6
Cadre preparation—*Vuzy*, *tekhnikums* and trade schools										
USSR total outlays (million rubles)	2,402.5	2,513.6	2,723.2	2,888.5	3,081.9	3,451.8	—	—	—	—
Investment (million rubles)	114.7	115.0	124.4	152.4	157.2	—	—	—	—	—
Outlays net of investment (million rubles)	2,287.8	2,398.6	2,598.8	2,736.1	2,924.7	3,251.1	3,562.1	3,948.4	4,290.5	4,597.7
Stipends (million rubles)	550.9	554.2	602.2	581.7	623.4	683.8	618.5	634.9	680.5	736.5
Outlays net of investment and stipends (million rubles)	1,737.5	1,845.2	2,005.4	2,163.8	2,309.9	2,573.9	2,950.0	3,322.5	3,617.0	3,866.5
Republic budget other current outlays (million rubles)	227.5	235.9	249.3	241.9	253.7	270.6	269.8	251.4	277.2	295.8
Republic budget outlays net of investment and stipends (million rubles)	1,022.7	1,078.6	1,158.7	1,139.0	1,210.2	1,394.4	1,381.0	1,341.8	1,480.3	1,584.3
Republic budget other current outlays as a percent of total	22.2	21.9	21.5	21.2	21.0	19.4	19.5	18.7	18.7	18.7
USSR other current outlays (million rubles)	386.5	403.6	431.5	459.5	484.2	499.5	576.3	622.5	677.3	721.9
All education-total										
Other current outlays (million rubles)	1,835.2	2,039.7	2,330.3	2,602.6	2,873.2	3,081.5	3,254.5	3,444.1	3,649.6	3,869.1
Price index for material expenditures (1970 = 100)	95.3	95.4	97.7	98.3	101.1	102.6	103.2	104.3	104.7	105.0
Other current outlays (million 1970 rubles)	2,045.4	2,269.9	2,532.2	2,810.4	3,017.0	3,189.6	3,347.8	3,505.3	3,702.8	3,912.7
Health										
Employment—thousands	3,461.	3,677.	3,818.	3,933.	4,082.	4,277.	4,427.	4,545.	4,747.	4,927.
Manhours—million	6,133.7	6,378.3	6,622.9	6,815.1	7,090.2	7,401.4	7,679.2	7,894.3	8,254.0	8,576.0
Republic budget outlays net of investment (million rubles)	4,076.9	4,381.8	4,642	4,937.9	5,321.5	6,281.1	6,609.9	6,940.8	7,607.0	8,002.1
Republic budget other current outlays (million rubles)	1,567.8	1,680.3	1,810.7	1,949.1	2,073.0	2,212.3	2,293.7	2,392.5	2,500.4	2,603.6
Republic budget other current outlays as percent of total outlays	39.4	39.1	39.7	40.2	39.7	36.0	35.5	35.4	33.8	33.6
USSR other current outlays (million rubles)	1,827.6	1,886.4	1,890.2	2,036.2	2,162.9	2,311.2	2,427.7	2,533.7	2,642.7	2,751.6
Price index for material expenditures (1970 = 100)	95.3	95.4	97.7	98.3	101.1	102.6	103.2	104.3	104.7	105.0
Other current outlays (million 1970 rubles)	2,036.9	2,099.4	2,054.0	2,198.8	2,271.2	2,392.2	2,497.4	2,578.7	2,681.2	2,782.6

Appendix F (continued)

	1970	1971	1972	1973	1974	1974	1976	1977	1978	1979
Education										
Personnel Services										
Education and culture—employment (thousands)	8,070.	8,309.	8,531.	8,759.	8,977.	9,191.	9,392.	9,622.	9,915.	10,128.
Culture—employment (thousands)	824.	876.	915.	964.	1,014.	1,056.	1,097.	1,161.	1,209.	1,235.
Education—employment (thousands)	7,246.	7,433.	7,616.	7,795.	7,963.	8,135.	8,295.	8,461.	8,706.	8,893.
Education and culture—manhours (million)	11,811.2	12,211.3	12,519.7	12,794.0	13,135.4	13,931.5	13,725.7	14,040.8	14,468.3	14,778.0
Culture—manhours (million)	1,467.3	1,568.7	1,635.3	1,71[illegible].9	1,304.6	1,376.4	1,949.2	2,058.6	2,143.4	2,189.0
Education—manhours (million)	10,344.0	10,642.6	10,884.4	11,082.1	11,330.9	11,555.1	11,776.5	11,982.2	12,324.9	12,589.0
Other current outlays										
Kindergartens										
Total outlays net of investment (million rubles)	2,600.4	2,755.8	2,922.9	3,167.6	3,328.5	3,513.3	3,713.0	3,979.0	4,277.0	14,518.0
Other current outlays as a percent of total outlays	53.0	52.9	51.7	50.4	50.4	51.4	51.4	51.4	51.4	51.4
Other current outlays (million rubles)	1,768.1	1,875.8	1,928.5	2,028.7	2,135.5	2,292.3	2,422.6	2,596.3	2,790.6	2,947.7
General education										
Republic budget non-investment outlays (million rubles)	1,768.1	1,875.8	1,928.5	2,028.7	2,135.5	2,292.3	2,422.6	2,596.3	2,790.6	2,947.5
Republic budget other current outlays (million rubles)	1,232.5	1,276.5	1,310.9	1,347.7	1,400.8	1,462.0	1,491.9	1,515.5	1,537.8	1,567.9
Republic budget other current outlays as a percent of total outlays	18.0	17.9	17.4	16.5	16.7	17.2	17.2	17.3	17.2	17.3
USSR outlays, less kindergartens' (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR investment outlays, less kindergardens (million rubles)	—	—	—	—	—	—	—	—	—	—
USSR outlays net of investment, less kindergartens (million rubles)	10,748.8	11,224.6	11,880.3	12,910.6	13,367.5	13,853.7	14,283.0	14.722.0	15,326.0	15,728.0
USSR other current outlays (million rubles)	1,464.3	1,517.4	1,559.3	1,604.0	1,678.1	1,775.2	1,819.3	1,858.3	1,901.4	1,944.8
Higher education *(Vuzy)*										
Outlays net of investment and stipends (million rubles)	1,097.8	1,151.6	1,221.5	1,285.4	1,354.5	1,420.6	1,485.6	1,561.1	1,648.6	1,717.9
Other current outlays (million rubles)	192.1	195.6	205.3	209.5	223.8	234.5	245.2	257.6	272.1	283.5
Other current outlays as a percent of total outlays	17.5	17.0	16.8	16.3	16.5	16.5	16.5	16.5	16.5	16.5

Specialized education (*tekhnikums*)										
Republic budget outlays net of investment and stipends (million rubles)	576.4	605.8	650.9	720.4	747.6	764.0	788.8	818.2	842.5	854.1
Republic budget other current outlays (million rubles)	119.0	125.9	131.5	135.9	142.4	146.2	150.9	156.6	161.2	163.5
Republic budget other current outlays as a percent of total outlays	20.6	20.8	20.2	18.9	19.0	19.1	19.1	19.1	19.1	19.1
Cadre preparation — *Vuzy, tekhnikums* and trade schools										
USSR total outlays (million rubles)				—	—	—	—	—	—	—
Investment (million rubles)				—	—	—	—	—	—	—
Outlays net of investment (million rubles)	4,853.6	5,145.8	5,572.4	6,177.2	6,630.3	7,019.4	7,387.0	7,734.0	8,108.0	8,393.0
Stipends (million rubles)	765.5	800.6	1,068.8	1,300.8	1,373.8	1,432.5	1,507.4	1,578.2	1,654.5	1,712.6
Outlays net of investment and stipends (million rubles)	4,091.7	4,347.2	4,504.8	4,877.6	5,257.5	5,587.5	5,880.2	6,156.4	6,454.1	6,681.0
Republic budget other current outlays (million rubles)	311.1	321.5	336.8	345.4	366.2	380.7	396.1	414.2	433.3	447.0
Republic budget outlays net of investment and stipends (million rubles)	1,674.2	1,757.4	1,872.4	2,005.8	2,102.1	2,184.6	2,274.4	2,379.3	2,491.1	2,572.0
Republic budget other current outlays as a percent of total	18.6	18.3	18.0	17.2	17.4	17.4	17.4	17.4	17.4	17.4
USSR other current outlays (million rubles)	760.3	795.3	810.3	839.9	915.9	973.7	1,024.1	1,071.7	1,122.6	1,161.1
All education — total										
Other current outlays (million rubles)	3,992.7	4,188.5	4,298.1	4,472.7	4,729.5	5,041.2	5,265.9	5,526.3	5,814.7	6,053.6
Price index for material expenditures (1970 = 100)	106.2	108.3	112.3	113.2	114.3	116.5	117.8	119.0	120.8	123.0
Other current outlays (million 1970 rubles)	3,992.7	4,109.0	4,064.7	4,194.8	4,392.6	4,597.4	4,746.4	4,931.0	5,110.9	5,223.4
Health										
Employment — thousands	5,080	5,239.	5,386.	5,522.	5,655.	5,769.	5,878.	5,962.	6,033.	6,197.
Manhours — million	8,832.9	9,136.1	9,382.9	9,587.9	9,831.0	10,020.1	10,209.7	10,344.6	10,467.8	10,752.0
Republic budget outlays net of investment (million rubles)	8,675.3	9,030.9	9,418.0	9,856.6	10,289.7	10,760.2	11,144.0	11,692.8	12,656.1	13,159.2
Republic budget other current outlays (million rubles)	2,936.5	3,012.3	3,161.9	3,272.2	3,422.0	3,578.6	3,706.2	3,888.8	4,209.0	4,376.4
Republic budget other current outlays as a share of total outlays	35.4	35.2	35.3	34.7	34.9	35.0	35.0	35.0	35.0	35.0
USSR outlays net of investment (million rubles)	8,785.0	9,033.	9,441.	9,950.	10,375.	10,823.	11,209	11,761.	12,730.	13,236.
USSR other current outlays (million rubles)	3,105.7	3,179.9	3,337.3	3,455.9	3,619.0	3,787.8	3,922.8	4,116.1	4,455.1	4,632.2
Price index for material expenditures (1970 = 100)	106.2	108.3	112.3	113.2	114.3	116.5	117.8	119.0	120.8	123.0
Other current outlays (million 1970 rubles)	3,105.7	3,119.6	3,156.1	3,241.2	3,361.2	3,454.3	3,535.8	3,672.7	3,915.8	3,999.3

	1980
Education	
Personnel Services	
Education and culture — employment (thousands)	10,475
Culture — employment (thousands)	1,265
Education — employment (thousands)	9,210
Education and culture — manhours (million)	15,285.5
Culture — manhours (million)	2,242.7
Education — manhours (million)	13,042.8
Other current outlays	
Kindergartens	
Total outlays net of investment (million rubles)	4,775.0
Other current outlays as a percent of total outlays	51.4
Other current outlays (million rubles)	3,115.8
General education	
Republic budget non-investment outlays (million rubles)	9,263.5
Republic budget other current outlays (million rubles)	1,608.2
Republic budget other current outlays as a percent of total outlays	17.4
USSR outlays, less kindergartens (million rubles)	
USSR investment outlays, less kindergartens (million rubles)	
USSR outlays net of investment, less kindergartens (million rubles)	16,121.2
USSR other current outlays (million rubles)	1,969.8
Higher education (*Vuzy*)	
Republic budget outlays net of investment and stipends (million rubles)	1,760.9
Republic budget other current outlays (million rubles)	290.6
Republic budget other current outlays as a percent of total outlays	16.5

Specialized education (*tekhnikums*)	
Republic budget outlays net of investment and stipends (million rubles)	875.4
Republic budget other current outlays (million rubles)	167.4
Republic budget other current outlays as a percent of total outlays	19.1
Cadre preparation (VUZ, *tekhnikums* and trade schools)	
USSR total outlays (million rubles)	
Investment (million rubles)	
Outlays net of investment (million rubles)	8,602.9
Stipends (million rubles)	1,790.8
General education stipends (million rubles)	0.3
Outlays net of investment and stipends (million rubles)	6,812.7
Republic budget other current outlays (million rubles)	455.0
Republic budget outlays net of investment and stipends (million rubles)	2,636.3
Republic budget other current outlays as a percent of total	17.4
USSR other current outlays (million rubles)	1,183.6
All education total	
Other current outlays (million rubles)	6,268.8
Price index for material expenditure (1970 = 100)	126.1
Other current outlays (million 1970 rubles)	5,278.8
Health	
Employment (thousands)	6,250
Manhours (million)	10,844.4
Republic budget outlays net of investment (million rubles)	13,554.0
Republic budget other current outlays (million rubles)	4,507.8
Republic budget other current outlays as percent of total outlays	35.0
USSR outlays net of investment (million rubles)	13,633.1
USSR other current outlays (million rubles)	4,771.3
Price index for material expenditure (1970 = 100)	126.1
Other current outlays (million 1970 rubles)	4,017.8